ADDENDUM: ECONOMIC GEOLOGY REPORT ER 84-1

The following citations should be added to the References:

Bannatyne, B.B.
1974: Pegmatite Project; in: Manitoba Mineral Resources Division Report of Field Activities 1974, p. 50.

Barry, G.S.
1962: Geology of the Munro Lake area, Manitoba Mines Branch Publication 61-1.

Manitoba
Energy and Mines
Geological Services

Economic Geology Report ER84-1

Industrial Minerals in Rare-element Pegmatites of Manitoba

By B.B. Bannatyne

Winnipeg, 1985

Energy and Mines

Hon. Wilson D. Parasiuk
Minister

Marc Eliesen
Acting Deputy Minister

Geological Services
W. David McRitchie
Director

Table of Contents

Page

Introduction 1
  Present work 1
  Acknowledgements 1

History of exploration, development, and geological studies 3

Pegmatites in the Falcon Lake-West Hawk Lake area 7
  Lucy pegmatite 7
    Results of the drill program 9
  Artdon pegmatite 9
  Subsurface pegmatite on the Alan 27 claim 12
  Molybdenite pegmatites in the Falcon Lake area 12
    Molly and Bendum claims 12
  Deer pegmatite, West Hawk Lake 15
  Radioactive minerals in pegmatites, Caddy Lake-Telford area 16
    Libby claim 17
    Found, Found 2 and Found 3 claims 17
    Lily Pond area 17
    Found claims, Eastern group, Caddy Lake 17
  Beryl pegmatite north of Telford 17

Rare-element pegmatites of the Winnipeg River/Bernic Lake/Cat Lake areas 19
  General statement 19

Pegmatite dykes in the Pointe du Bois area (Lac du Bois to east of Lamprey Falls) 20
  Lac du Bois pegmatite 20
  K-1 pegmatite 20
  Lucky No. 3 pegmatite 21
  Pine claim, Winnipeg River 21

Pegmatites of the Greer Lake area 22
  Greer Lake pegmatitic granite and pegmatites 22
    Clare 1 claim 22
    Annie and Grey pegmatites 22
    Rapid pegmatite 23
  Silverleaf pegmatite 23
  Huron pegmatite 25
  Greer Lake area: development and production 26
    Greer Lake feldspar quarry 28
    Pegmatite southwest of feldspar quarry: GL-1 28
    Grace 1 claim: GL-2, GL-2A 28
    Beryl dyke, Grace 2 claim: GL-6 30
    Top-of-the-World pegmatite 30
    Pegmatite south of Greer Lake: GL-3 30
    Pegmatites southwest of Greer Lake 30
      Pegmatite GL-7 30
      Pegmatite GL-9 30
      Pegmatite GL-12 31
      Pegmatite GL-12A 31
      Pegmatite GL-8 31
      Cleo pegmatite: GL-4A and 4B 32
      Huron 1 pegmatite: GL-11 32

Pegmatite dykes at north end of Eaglenest Lake 33

Pegmatite dykes of the Shatford Lake area 34
  Cassiterite dyke, Tin Island 34
  Main pegmatite area, south shore of Shatford Lake: A to I 34
  Pegmatite dykes, Dyke 5 claim 37
  Pegmatites on Dyke 12 claim south of Tin Island 37
  Pegmatites east and southeast of Shatford Lake 38
  Bunty claims, western end of Shatford Lake 38
  Pegmatitic granite at northwestern end of Shatford Lake 38

Page

Pegmatites in Shatford Creek-Bird River area 39
Crocodile and Success pegmatites 39
Holy Bible pegmatite, southeast of Bird River bridge 39
Matty and Tappy pegmatites 39

Pegmatites at Bernic Lake 42

Tanco pegmatite, western end of Bernic Lake 43

Pegmatites at the eastern end of Bernic Lake 50
Pegmatite 1 50
Pegmatite 2 50
Pegmatite 3, Main Workings, Buck Claim 50
Pegmatite 4 53
Pegmatites 5 and 6, Pegli 2 claim 53
Pegmatite 7, Coe claim 53
Pegmatite 8 53
Pegmatite 9 53
Pegmatite 10 54
Main subsurface pegmatites, Bernic Lake East 55

Pegmatites of the Rush Lake area 56
Rush Group: RL-1 56
Pegmatite northwest of Rush Lake: RL-3 57
Stannite and Cubo pegmatites 57
Bernic dyke (Odd West) 57
Odd pegmatite 59
Other pegmatites north of Rush Lake 59

Birse Lake pegmatite group 60
Rose quartz pegmatite, Birse Lake 60

Pegmatites of the Cat Lake area 61
Irgon pegmatite 61
F.D. No. 5 pegmatite 64
Central pegmatite 64
Dykes north of the Central pegmatite 65
Dykes at southeastern end of Cat Lake 65
Eagle pegmatite 65

Pegmatites of the Donner Lake area 69
Main dyke 70
High-grade dyke 72
Northwest dyke 72

Pegmatites at Crowduck Bay, Wekusko Lake 73
Sherritt Gordon Mines Limited: Gold Reef Claims 75
Combined Developments Limited: Violet group 77
Pegmatite on south part of Violet group 78
Green Bay Mining & Exploration Limited: Lit Group 79
Main dyke, Green Bay property 79
Other dykes, Green Bay 79

Granville Lake beryl pegmatite 80

Pegmatites of the Cross Lake area 81
Cross Lake spodumene pegmatites 81
Cross Lake area, recent work, 1980-1983 82

Pegmatite dykes, northeastern Manitoba 83
Lake 'J' (McLaughlin Lake) pegmatite, Oxford Lake area 83
Pegmatites of the Red Sucker Lake area 85
Pegmatites of the Red Cross Lake area 87

Other pegmatites, northern Manitoba 89
A. Superior Province 89
Little Playgreen Lake 89
Gorman Lake 89

Page
BIL group, Gods Lake 89
Bear Lake area 89
Cuthbert Lake 89

B. Churchill Province 89
Wolf Rapid 89
Southern Indian Lake 89
Zangeza Bay, Reindeer Lake 89
Veal Lake 89

References 90

Appendix: Other molybdenite-bearing pegmatites, Barren Lake to Star Lake 95

FIGURES

1. Locality map and generalized geological map of Manitoba 2
2. Tanco minesite, northwestern part of Bernic Lake 4
3. Geology of the Falcon Lake-West Hawk Lake area 6
4. Location of Lucy and Artdon pegmatites 7
5. Plan and cross-sections of Lucy pegmatite 8
6. Coarse spodumene with chalky alteration along fracture, Lucy pegmatite 9
7. Lucy pegmatite: drill hole locations and structure contour 10
8. Plan of outcrops and drill holes, Artdon pegmatite 11
9. Coarse spodumene crystals, Artdon pegmatite 12
10. Molly and Bendum pegmatites: plan of trenches 13
11. Plan of drill holes and outcrops, Deer pegmatite 14
12. Spodumene in thin-bladed crystals, Deer pegmatite 15
13. Radioactive localities, Telford-Caddy Lake area 16
14. Location of pegmatites in Pointe du Bois-Winnipeg River region 18
15. Location of Lac du Bois pegmatite 20
16. Location of K-1, Lucky No 3, and Pointe du Bois pegmatites 21
17. Plan of drill holes, Lucky No. 3 pegmatite 21
18. Pegmatites and pegmatitic granite in the Greer Lake area 22
19. Plan and section, Silverleaf pegmatite 23
20. Silverleaf pegmatite, radiating lithian muscovite 24
21. Diagrammatic plan and section, main exposure of the Huron pegmatite 25
22. Huron pegmatite, upper contact 25
23. Huron pegmatite, lower contact 27
24. Dalhart Minerals Corp., old mill for beryl, south of Greer Lake 27
25. Feldspar quarry, eastern end 28
26. Sketch map of Grace 1 pegmatite 28
27. Grace 1 pegmatite, northeastern pit, showing saccharoidal albite unit 29
28. Grace 1 pegmatite, northeastern pit, beryl + quartz + mica zone 29
29. GL-9 pegmatite, western end, showing shallow dips of sheeting 31
30. Regional geology and pegmatites, Shatford Lake 34
31. Geology of Contact Minerals Limited pegmatite 35
32. Curved lithian muscovite (called 'zinnwaldite' in early reports) 36
33. Beryl crystals aggregating 72 cm in length near trench 'F' 36
34. Radiating clusters of altered allanite crystals, Shatford Lake 37

Figures (cont'd.) Page

35. Bunty pegmatite, western end of Shatford Lake 38
36. Rare-element pegmatites near Bird River bridge 39
37. Matty and Tappy pegmatites: plan and drilling results 40
38. Bernic Lake pegmatites, and probable location of postulated source 42
39. Pegmatites exposed in 1930 at present Tanco minesite 43
40. Tanco minesite and tailings pit, Bernic Lake 45
41. Isopach plan of Tanco pegmatite 46
42. Cross-section of Tanco pegmatite 46
43. North face of pollucite sub-drift, showing amphibolite, wall zone, quartz pod, and pollucite unit at base 48
44. Milky amblygonite in quartz, Tanco mine 48
45. Banded saccharoidal albite, Tanco mine 49
46. Axe-shaped wodginite crystals, albitized central intermediate zone, Tanco mine 49
47. Location of Buck, Coe and Pegli pegmatites, east end of Bernic Lake 50
48. West-dipping fracture planes in steeply dipping amphibolites, north shore of Bernic Lake near eastern end 51
49. Plan and section of Buck pegmatite 52
50. Tantalite crystal aggregate, 5 cm across, Buck pegmatite 52
51. Spodumene + quartz pseudomorph of petalite, between masses of milky white amblygonite 52
52. Metavolcanic inclusions with pseudoconcentric orientation along margin of Pegmatite 8 54
53. Cyclic twinned crystal of cassiterite, Pegmatite 10 54
54. Diagrammatic cross-section of two pegmatite sheets, east end of Bernic Lake 55
55. Pegmatites near Rush Lake 56
56. Drilling results for the Sn-bearing Odd pegmatite 58
57. Diagrammatic map of Birse Lake pegmatite group 60
58. Pegmatites near Cat Lake 61
59. Plan of Irgon pegmatite 62
60. Irgon pegmatite: well developed banded structure 63
61. Irgon pegmatite: cross-cutting quartz-spodumene veins 63
62. Irgon pegmatite: euhedral to subhedral quartz and diversely oriented spodumene 64
63. Central pegmatite; pit below upper contact 65
64. Plan of Eagle pegmatite, Cat Lake 66
65. Cross-sections of Eagle pegmatite 67
66. Eagle pegmatite: western end 68
67. Pegmatites near Donner Lake 69
68. Twinned laths of coarse spodumene separated by quartz, Main dyke, Donner Lake 70
69. Cross-sections of coarse spodumene in microcline + quartz matrix, Main dyke, Donner Lake 70
70. Drilling results, Donner Lake pegmatites 71
71. Locality map, rare-element pegmatites in northern Manitoba 73
72. Crowduck Bay, Wekusko Lake: generalized geology 74
73. Spodumene-bearing "Sherritt Gordon" pegmatites 76
74. Violet pegmatite: plan of outcrop 77
75. Spodumene crystals in typical near parallel alignment, Violet pegmatite 77
76. Alternating bands of bladed spodumene and quartzofeldspathic pegmatite, Violet pegmatite 78
77. Violet pegmatite: drilling results 78
78. Green Bay main pegmatite 79
79. Granville Lake beryl-bearing pegmatite 80
80. Cross Lake: generalized geology and rare-element pegmatites 81
81. South contact of spodumene-bearing pegmatite, Metis Island 82

Figures (cont'd.)

		Page
82.	McLaughlin Lake (Lake 'J'): Oxford House area	83
83.	Cross-section of primary spodumene crystals, McLaughlin Lake pegmatite	83
84.	Red Sucker Lake area	85
85.	Saccharoidal albite with disseminated cassiterite crystals, Red Sucker Lake	86
86.	Twinned crystals of cassiterite, Red Sucker Lake	86
87.	Red Cross Lake area: regional geology	87
88.	Stringers of Li-mica parallel to contacts of sheared pegmatites, Red Cross Lake	88
89.	Alternating bands of lepidolite and quartzofeldspathic layers, Red Cross Lake pegmatite	88

TABLES

1.	Production from Tanco pegmatite	5
2.	Total radiation in counts per second, Telford-Caddy Lake	17
3.	Ta-Nb minerals, Huron pegmatite	26
4.	Tanco pegmatite: compiled reserves, December 31, 1982	44
5.	Recent mineralogical studies of the Tanco pegmatite	45
6.	Zoning of the Tanco pegmatite (from Černý, 1982)	47
7.	Mineralogy of zones in Pegmatite 3, Buck claim	51

INTRODUCTION

This report describes rare-element pegmatites that occur in several areas in Manitoba (Fig. 1). They have been the source of industrial minerals such as feldspar, lithium minerals, and others (see below), as well as metallic minerals, such as molybdenite, tantalite-columbite and cassiterite. Radioactive mineral occurrences in pegmatite also are described.

The pegmatites range in size from small pods or lenses, to the giant, zoned Tanco deposit, one of the world's major pegmatites. Most of the known pegmatite occurrences are in southeastern Manitoba in three distinct fields:

1) Falcon Lake-West Hawk Lake-Cuddy Lake;
2) Winnipeg River-Bernic Lake, and
3) Cat Lake-Donner Lake.

Other pegmatites occur in northern Manitoba, notably at Wekusko Lake and at Cross Lake, near Oxford Lake, at Red Sucker Lake, Gods Lake, and Red Cross Lake.

Development prior to 1969 resulted in production of small amounts of amblygonite, beryl, feldspar, lepidolite, molybdenite, pollucite, spodumene and quartz, as well as minor quantities of cassiterite, rose quartz, topaz, tourmaline, and 'columbite-tantalite'.

In 1969, production of tantalite from the Tanco pegmatite at Bernic Lake initiated large-scale mining from Manitoba's pegmatites. Lesser tonnages of quartz, pollucite, lepidolite, spodumene and beryl also have been recovered from that deposit. Considerable test work on Tanco's low-iron spodumene, suitable for refractory ceramics and other uses, has been completed, but as of 1983 firm plans for production have not been announced.

Present Work

This report brings together data relating to rare-element pegmatites of Manitoba, most of which have been described either briefly or in detail in the geological literature.

The major part of this report comprises descriptions of the pegmatites, their dimensions, major structure, mineralogy, and locations. Field data have been augmented wherever possible by data from non-confidential assessment reports which contain much unpublished information, mainly drilling results and assays of samples. These reports are on file at the Exploration Services Section (ESS), Manitoba Department of Energy and Mines. In addition, descriptions of many pegmatites are contained in Mineral Resources Division files, and information from these reports has been included, particularly from those reports written when the deposits were freshly exposed, some as many as 65 years ago.

Work carried out at the University of Manitoba, (Department of Earth Sciences and Centre for Precambrian Studies), mainly by or under the direction of P. Černý, R.B. Ferguson and A.C. Turnock, has been concerned mainly with the Tanco pegmatite and other pegmatites in the Winnipeg River-Cat Lake areas; a recent study included the Wekusko Lake pegmatites. Detailed mineralogical studies, regional structural studies, and geochemical relations between pegmatites and host and/or source rocks have been reported, as well as criteria for exploration work, including an assessment of the geochemical potential of various pegmatite groups and a discussion of exploration target areas (Černý et al., 1981, p. 152-154 and 202-295). References to the University work are made wherever possible, but a large amount of data has been generated by these investigators since 1969. Their major reports include an on-going series of papers on the Tanco pegmatite published in the Canadian Mineralogist (1972 to present), and the report by Černý et al. (1981), funded by the Manitoba/Canada Mineral Exploration and Development Agreement under contract with the Centre for Precambrian Studies. Their studies have been extended to include rare-element mineral pegmatites in the northern Superior Province, from Cross Lake to Red Cross Lake.

The information in this report is designed to supplement the detailed mineralogical, geochemical, and structural studies described elsewhere, and to indicate available sources of information to those interested in development of pegmatite deposits of Manitoba.

Acknowledgements

Field work was done primarily in 1972 and 1973, when the writer was ably assisted by Malcolm Cameron and Lawrence Solkoski, respectively. Much time was spent locating many of the pegmatites and an effort has been made to accurately locate them on the figures included in this report. The remaining time was spent examining the pegmatites themselves, and in collecting samples. As only 55 days were spent in actual examination of more than 120 pegmatites, only the major features of the pegmatites were recorded, and the surrounding rocks were examined only briefly.

Mineral samples have been identified by X-ray powder photograph and X-ray diffraction by L. Solkoski, J. Macek, C. McGregor and J. Timchuk. Most of the work involved identification of Ta-Nb minerals.

Most of the figures have been drafted by M. Simmons, and some by C. Sandy. The manuscript was typed by B. Thakrar. W.D. McRitchie and P.G. Lenton provided helpful editorial comments.

The writer is indebted to P. Černý, both for permission to quote an extensive section from one of his reports on the Tanco pegmatite, and for other assistance during the course of this study.

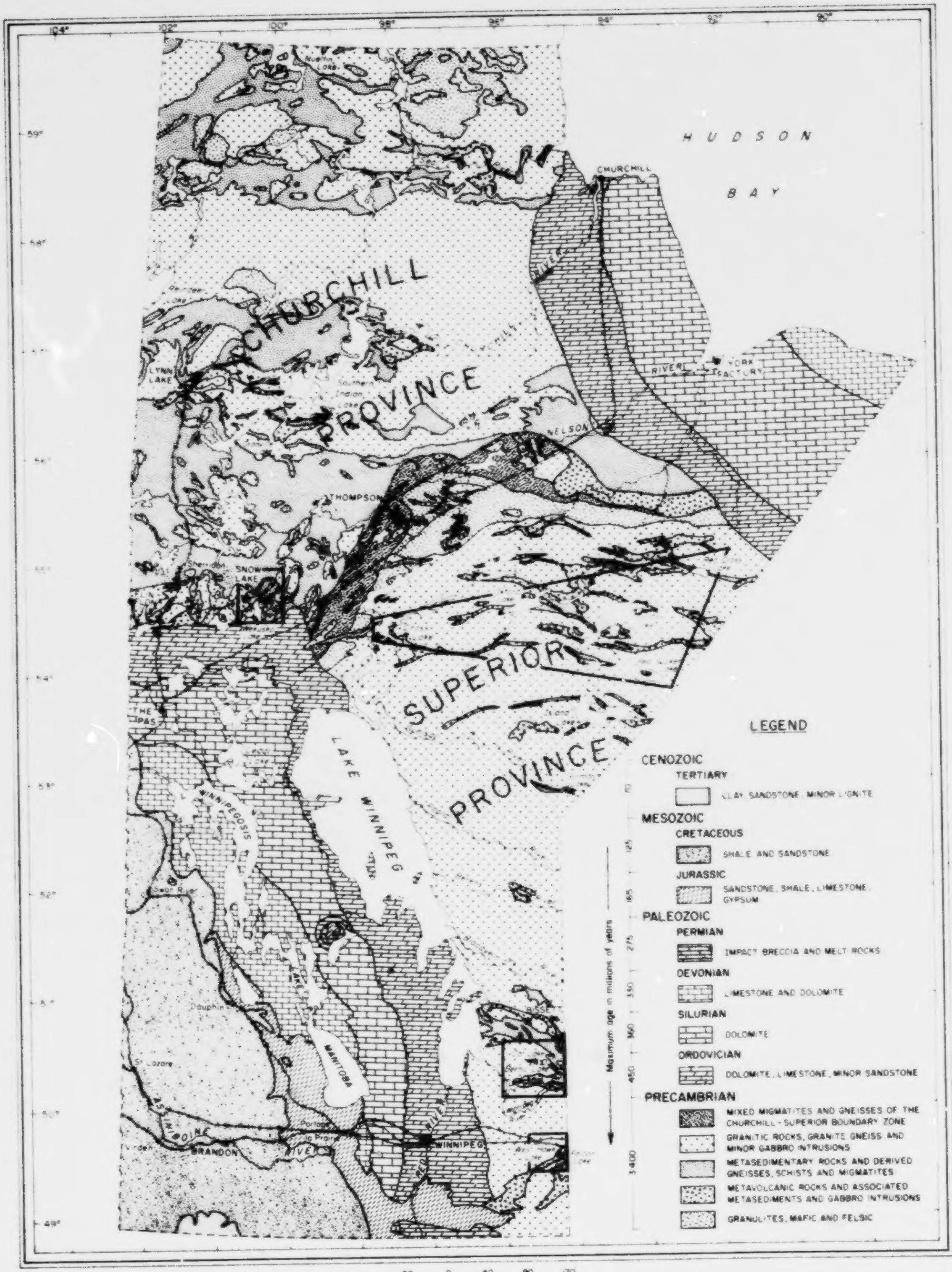

104°
102°
100°
98°
96°
94°
92°
90°
59°
58°
57°
56°
55°
54°
53°
52°
51°
50°
49°
Nueltin Lake
HUDSON
BAY
CHURCHILL
RIVER
CHURCHILL
PROVINCE
LYNN LAKE
Southern Indian Lake
Reindeer Lake
YORK FACTORY
RIVER
NELSON
THOMPSON
Sherridon
SNOW LAKE
SUPERIOR
PROVINCE
Island Lake
THE PAS
LAKE WINNIPEG
WINNIPEGOSIS
Cedar Lake
Swan River
Dauphin
LAKE MANITOBA
St Lazare
ASSINIBOINE
RIVER
Virden
BRANDON
Portage la Prairie
WINNIPEG
RED RIVER
BISSETT
LEGEND
CENOZOIC
TERTIARY
CLAY, SANDSTONE, MINOR LIGNITE
MESOZOIC
CRETACEOUS
SHALE AND SANDSTONE
JURASSIC
SANDSTONE, SHALE, LIMESTONE, GYPSUM
PALEOZOIC
PERMIAN
IMPACT BRECCIA AND MELT ROCKS
DEVONIAN
LIMESTONE AND DOLOMITE
SILURIAN
DOLOMITE
ORDOVICIAN
DOLOMITE, LIMESTONE, MINOR SANDSTONE
PRECAMBRIAN
MIXED MIGMATITES AND GNEISSES OF THE CHURCHILL - SUPERIOR BOUNDARY ZONE
GRANITIC ROCKS, GRANITE GNEISS AND MINOR GABBRO INTRUSIONS
METASEDIMENTARY ROCKS AND DERIVED GNEISSES, SCHISTS AND MIGMATITES
METAVOLCANIC ROCKS AND ASSOCIATED METASEDIMENTS AND GABBRO INTRUSIONS
GRANULITES, MAFIC AND FELSIC
Maximum age in millions of years
70
125
165
275
330
360
450
3400
40
0
40
80
120
KILOMETRES

Figure 1　*Locality map and generalized geological map of Manitoba.*

HISTORY OF EXPLORATION, DEVELOPMENT, AND GEOLOGICAL STUDIES

Exploration and development of granitic pegmatites in Manitoba has been episodic, with the search for one or two elements dominating different periods. Each new active period usually resulted in the discovery of previously unknown occurrences of rare-element minerals.

1) Pre-1900

The first known report of pegmatite mineralization is that by J.B. Tyrrell during field work in 1898 in the Little Playgreen Lake area north of Norway House, where "rounded crystalline aggregates of molybdenite in red pegmatite veins" were noted (Tyrrell and Dowling, 1900, p. 9, 16).

2) 1900 to 1939

Molybdenite reportedly was found in 1900 in pegmatites north of Falcon Lake, but the Gull and Tomboy claims (later the Molly and Bendum) were not staked until 1917. Falcon Lake Mining and Milling Company produced 900 gm of pure flake molybdenite and some hand-cobbed "10% ore". These deposits, and others nearby, are described by DeLury (1917), Bruce (1917), Eardley-Wilmot (1925), Dawson (1942) and Vokes (1963).

Lepidolite was found about 1916 in the Deer pegmatite at West Hawk Lake. Lithium mineralization was discovered in 1924 on the Bear (Bob) claim, and Silver Leaf Mining Syndicate stockpiled 200 tonnes of spodumene and 109 tonnes of lepidolite between 1926 and 1928. From this, 68 tonnes of spodumene and lepidolite was shipped to various countries for experimental work. The deposit is described by Stockwell, in Wright (1932) and also in Stockwell (1933a).

In 1926, the Irgon and Cat Lake (Central pegmatite) claims were staked in the Cat Lake area, and some surface work was done; in 1928 the Spud Group, later the Eagle, was staked there. Lithium, tin and beryllium mineralization was found at Bernic Lake and Shatford Lake between 1926 and 1928. Consolidated Tin Mining Company Limited quarried 181 tonnes of lithium minerals from the Buck claim. The Manitoba Tin Company sank a shaft to investigate a cassiterite showing on a small island near the east end of Shatford Lake, but little cassiterite was found. The most productive operation was that of Jack Nutt Mines Limited on the Akmen claim (now part of Tanco holdings), at the northwestern part of Bernic Lake. A shaft was sunk to 45 m, a pilot mill produced 1330 kg of concentrate containing 895 kg of tin, a trial shipment of 454 kg of beryl was sent to New York, and a drilling program indicated the presence of a lithium-bearing pegmatite at depth, which later became the Tanco orebody. Also in 1928, rose quartz was found on the Diamond claim (later the Rose) near Birse Lake; some was shipped to Germany, and costume jewellery made from it was sold in Winnipeg. Cassiterite was found in 1929 on the Odd dyke, the Rush Group, and the Cubo-Stannite dykes near Rush Lake; the Odd dyke was drilled in 1942 by the Federal Department of Mines and Resources, but production was not achieved. Early reports on these deposits include DeLury (1929), Derry (1930), McCartney (1930), Wright (1932) and Bateman (1943).

In 1930, Winnipeg River Tin Mines Limited produced 544 tonnes of feldspar from the Huron claim, south of Winnipeg River; it was used by Winnipeg Roofing Company for stucco dash and poultry grit. Also, a 9 kg sample of tantalite-columbite was sent to the Federal Department of Mineral Resources in 1930, and a small amount of "chrysoberyl" was reportedly sold in 1933. The Winnipeg River Tin quarry at Greer Lake was the source of several thousand tonnes of feldspar for ceramic use by Feldspar Products Limited of Minnesota, and a few hundred tonnes of lower grade feldspar for stucco dash for Manitoba Gypsum Co., Winnipeg, between 1933 and 1935. During this period, feldspar was produced from the K-1 claim north of Pointe du Bois, and beryl was quarried there and on the Grace, Grace 2, Jewel and Pine claims in the Greer Lake-Winnipeg River area; a small quantity of the beryl was used as a semi-precious stone.

In 1931, the first known spodumene-bearing pegmatite in northern Manitoba was staked as the Gold Reef claims west of Crowduck Bay, Wekusko Lake; three dykes were located on the property. Shepherd (1938) reviewed "The lithium situation in Manitoba".

3) 1940 to 1953

In the 1940s, cassiterite deposits at Rush Lake and Red Sucker Lake were investigated (Bateman, 1943), as were molybdenum and tungsten deposits in the Falcon Lake-Star Lake area. At Bernic Lake, Lithium Corporation of Canada Limited quarried 1186 tons of pegmatite from the Buck, Coe and Pegli claims, and it was sorted into stockpiles of spodumene, amblygonite, triphylite, and tourmaline; 29 tonnes of amblygonite were sold. Spodumene-bearing pegmatites in the Cat Lake-Donner Lake area were investigated on the F.D. No. 5, the Eagle group (drilled in 1944) and the Spot claims. The Lucy and Artdon spodumene-beryl pegmatites west of Falcon Lake were found in 1943 and 1937, respectively; the Artdon was drilled in 1943.

Regional reports of the geology and mineral deposits, including pegmatite, of the area were initiated by geologists with the Manitoba Mines Branch: Springer (1948, 1949a,b, 1950, 1952) and Davies (1952, 1954, 1955, 1956a, 1957).

In the early 1950s, occurrences of uranium mineralization in pegmatites were investigated between Rennie and Caddy Lake, and east of Wekusko Lake at Dion and Watch Lakes. Some of the these deposits are described by Springer (1952) and Lang (1952).

4) 1954 to 1968

The major period of exploration and initial development of pegmatites in Manitoba was from 1954 to 1957, with the major target being lithium mineralization; two areas were explored for beryl. Detailed results of exploration are discussed under individual pegmatites in this report.

From south to north, the major exploration programs are reviewed briefly.

In the Falcon Lake-West Hawk Lake area, the Lucy (Li-Be) and Deer (Li) pegmatites were drilled.

South of Winnipeg River, Lithium Corporation of Canada Limited drilled the Silverleaf pegmatite in 1954. Dalhart Beryllium in 1956-1957 produced some 20 tonnes of hand-cobbed beryl crystals and many tonnes of low grade beryl-bearing ore from at least 14 pegmatites around Greer Lake. At Shatford Lake, beryl dykes with other rare-element minerals were trenched by Contact Minerals Limited in 1957.

At Bernic Lake, drilling on the former Jack Nutt property began in 1955, and resulted in the delineation of one of the world's major pegmatites, the Tanco deposit (q.v., for more details). Shaft sinking began in 1957, and shipments of spodumene, amblygonite, pollucite, beryl and quartz were made prior to the temporary closing of the mine in 1961. Identification of commercial amounts of tantalite mineralization (Nickel et al., 1963) resulted in additional drilling in 1967, and first production of tantalite concentrates in 1969-1970, which has continued since then except for a few interruptions. Initial tonnage estimate was 1.77 million tonnes, grading 0.23% Ta_2O_5. Trial shipments of lepidolite containing gallium have been made, and tests of the low-iron spodumene

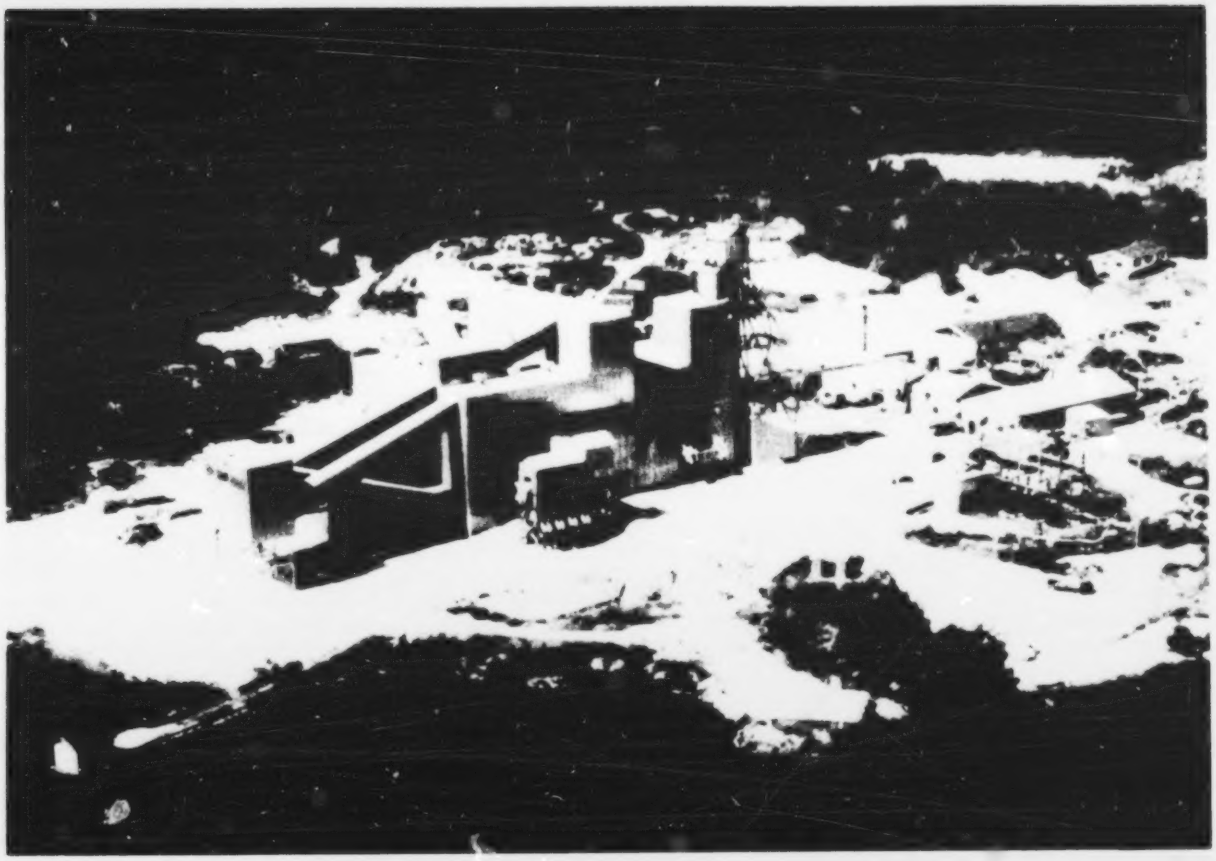


Figure 2: Tanco minesite, northwestern part of Bernic Lake.

for various ceramic and other uses have been completed. Production was suspended at the end of 1982 because of poor markets and a large inventory of tantalite concentrates.

Drilling at the east end of Bernic Lake by Lithium Corporation of Canada in 1956 resulted in outlining 736 000 tonnes of pegmatite, grading 2.13% Li_2O, that contains concentrations of spodumene, amblygonite, lepidolite and petalite. The company also sank a shaft on the Irgon claim at Cat Lake, but only a small amount of spodumene ore from crosscuts was stockpiled before the operation closed in 1957. Drilling in the Donner Lake area by Violamac Mines Limited in 1955-1956 outlined large reserves of spodumene in two major pegmatites. A small pollucite-bearing pegmatite was later identified on that property. Pegmatite dykes containing spodumene were drilled in 1956-1957 near the Bird River bridge.

Additional spodumene-bearing pegmatites were found and drilled in the Wekusko Lake area. Long, near-vertical dykes were drilled in 1956-1957 by Combined Developments Limited and by Green Bay Mining and Exploration Ltd. Both deposits occur east of Crowduck Bay. They are reported to contain a few million tonnes of moderate grade lithium ore (spodumene).

Three other pegmatites were discovered in north-central Manitoba: on the Liz Group in 1958 at Cross Lake; a spodumene-bearing pegmatite located by G.S. Barry during a Manitoba government geological survey in 1959 southeast of Oxford Lake; and a lithium deposit of moderate size and grade on the north shore of Gods Lake, drilled by Inco Limited in 1959-1960 (Davies et al., 1962). Pegmatites containing lithium micas with high rubidium contents were described from the Red Cross Lake area by Potter (1962) and Jambor and Potter (1967).

A number of geological reports and papers resulted from the extensive exploration work from 1954 to 1960. Early reports on the Tanco (originally Montgary, subsequently Chemalloy) pegmatites are those by Davies (1957, p. 25-27), Hutchinson (1959), Brinsmead (1960), Wright (1961, 1963) and Nickel (1961). Pollucite was identified in the Tanco deposit in 1957 by Hutchinson (1959), and is described by Mulligan (1961) and Nickel (1960, 1961).

Review papers on the exploration results are those of Davies (1956a, 1958), Rowe (1956), Mulligan (1957) and Davies et al. (1962). In The Economic Geology Series of the Geological Survey of Canada, reports on lithium, beryllium and tin were prepared by Mulligan (1965, 1968, and 1975, respectively).

Exploration work stopped in the late 1950s when an expected expansion in lithium markets failed to materialize. About 20 million tonnes of lithium ore had been outlined, and no major development has occurred as yet. The major reserve is the 6 668 000 tonnes grading 2.75% Li_2O in the Tanco pegmatite.

Table 1. Production from Tanco pegmatite

	Spodumene (sp) or amblygonite (am) tonnes	Pollucite contained Cs_2O kg sold	Tantalite contained Ta_2O_5 kg
1958	sp (907, stockpiled)		
1959	am 907		
1960	am 2722	2268	
1961	sp 36	2268	
1962		2268	
1963		2268	
1964		9072	
1965-1968	No production		
1969		9072	59103
1970	sp 907	? 36288	143802
1971		90720	203943
1972		19618	18652
1973	sp 181	68040	77376
1974	sp 1814	? 71887	198877
1975		? 78640	178304
1976			139833
1977			139757
1978			158776
1979			158845
1980			127000
1981			103949
1982			59000
1983			Nil

NOTES

1. In 1959, some beryllium ore was shipped to U.S.A.
2. In 1959 and 1960, a combined total of more than 900 tonnes of quartz was sold for decorative aggregate.
3. In 1972, 1973 and 1974, some gallium ore was shipped, some to Trail and some to U.S.A.

Sources: J. Bamburak, Exploration Services Section; Canadian Minerals Yearbook

5) 1969 to 1982

Following the exploration drilling that outlined 1 815 000 tonnes of 0.24% Ta_2O_5 in the Tanco pegmatite, the property was brought into production in 1969, and represents the first and only large-scale mining of pegmatite in Manitoba (Fig. 2). Published production figures, compiled by J.D. Bamburak, are listed in Table 1.

Extensive exploration work in the Bernic Lake, Rush Lake and Birse Lake areas was completed by Tanco and subsidiary companies. Available reports are on file with the Exploration Services Section (ESS). Some exploration work, primarily on beryl-bearing pegmatites, was completed by Spacemaster Resources Limited, who acquired properties once held by Winnipeg River Tin and others in the Shatford Lake-Winnipeg River area. Tanco extended its exploration work to these areas, and then, in the early 1980s, to the Cat Lake and northern Manitoba pegmatite fields. To date, no announcements of any significant new discoveries have been made.

Plans for a lithium carbonate plant have been proposed and reviewed periodically by Tanco, but in 1982 no plan for production had been announced. Continuing interest in possible markets for beryllium, cesium, gallium, quartz and feldspar is being maintained. To date, a wide variety of minerals has been identified in the deposit, but no gem quality material has been reported.

Recent reports on the geology of the Tanco deposit include Wright (1961, 1963), Crouse and Černý (1972), Crouse et al. (1979) and Černý (1982). The major regional study is the report on the Cat Lake-Winnipeg River and the Wekusko Lake pegmatite fields (Černý et al., 1981), in which reference to the many mineralogical and other studies is made (op. cit., p. 206-216).

Numerous regional geological studies are listed in various bibliographies and publication catalogues of the Geological Survey of Canada and the Geological Services Branch of Manitoba. A general description of rare-element minerals and their occurrence in pegmatites in Manitoba is included in a report by Phillips (1978).

A history of the exploration and development, and a brief geological description, of each property is included in the Mineral Inventory cards, reproduced on microfiche, in Bamburak (1980).

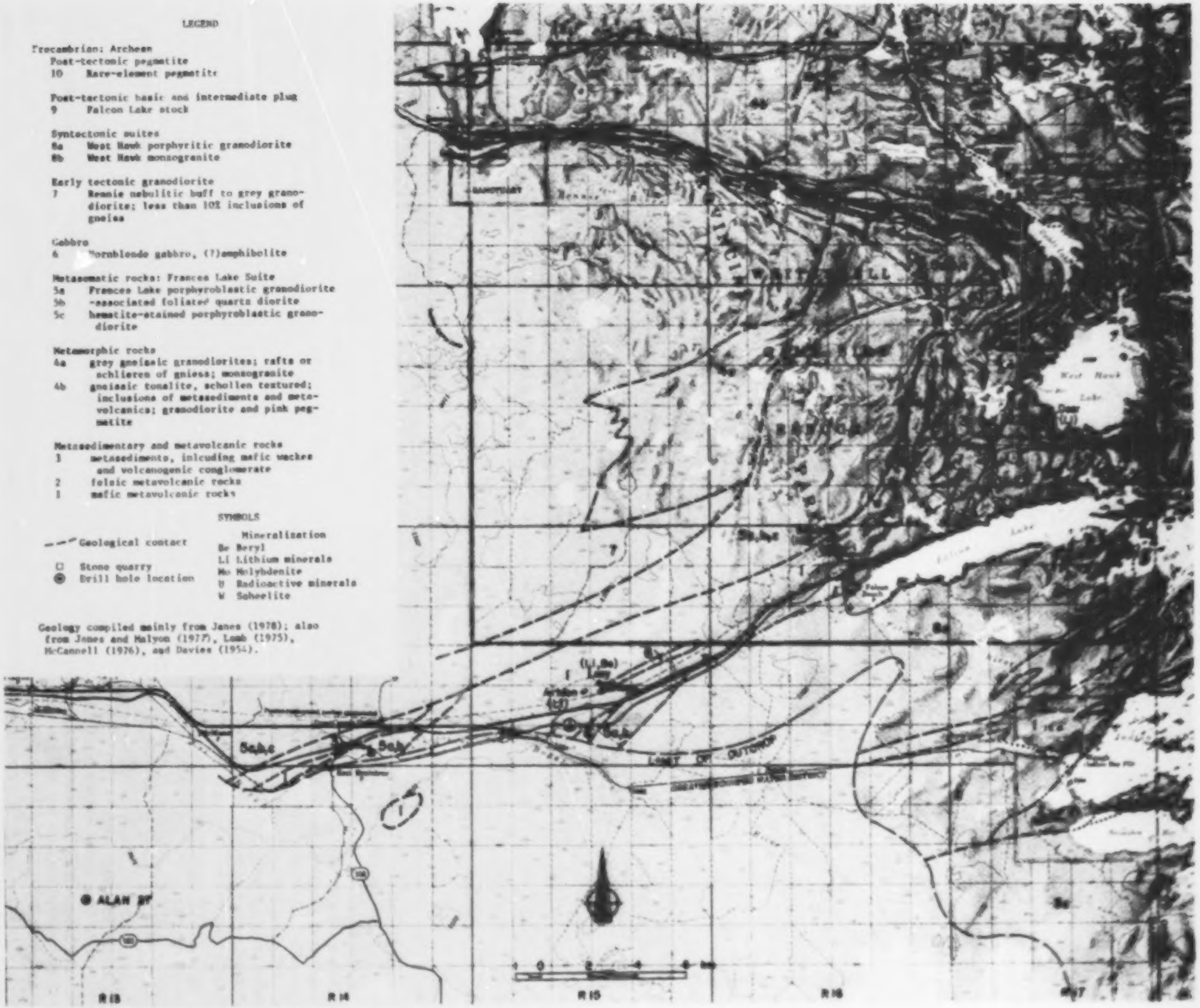

LEGEND
Precambrian: Archean
Post-tectonic pegmatite
10 Rare-element pegmatite
Post-tectonic basic and intermediate plug
9 Falcon Lake stock
Syntectonic suites
8a West Hawk porphyritic granodiorite
8b West Hawk monzogranite
Early tectonic granodiorite
7 Rennie nebulitic buff to grey granodiorite; less than 10% inclusions of gneiss
Gabbro
6 Hornblende gabbro, (?)amphibolite
Metasomatic rocks: Frances Lake Suite
5a Frances Lake porphyroblastic granodiorite
5b -associated foliated quartz diorite
5c hematite-stained porphyroblastic granodiorite
Metamorphic rocks
4a grey gneissic granodiorites; rafts or schlieren of gneiss; monzogranite
4b gneissic tonalite, schollen textured; inclusions of metasediments and metavolcanics; granodiorite and pink pegmatite
Metasedimentary and metavolcanic rocks
3 metasediments, inlcuding mafic wackes and volcanogenic conglomerate
2 felsic metavolcanic rocks
1 mafic metavolcanic rocks
SYMBOLS
Geological contact
□ Stone quarry
● Drill hole location
Mineralization
Be Beryl
Li Lithium minerals
Mo Molybdenite
U Radioactive minerals
W Scheelite
Geology compiled mainly from Janes (1978); also from Janes and Malyon (1977), Lamb (1975), McCannell (1976), and Davies (1954).
West Hawk Lake
Falcon Lake
LIMIT OF OUTCROP
5a,b,c
5a,b
(Li,Be)
8a
7
1
ALAN 27
0 2 4 6
R13
R14
R15
R16
R17

Figure 3 *Geology of the Falcon Lake/West Hawk Lake area*

PEGMATITES IN THE FALCON LAKE-WEST HAWK LAKE AREA

Pegmatites containing lithium minerals, beryl, molybdenite, and uranium mineralization occur in and near the southern part of Whiteshell Provincial Park. Minor amounts of scheelite occur mainly in quartz veins. The only recorded production is a small quantity of molybdenite in 1917 and 1918.

In the southern part of the area, Archean mafic metavolcanics of the West Hawk Lake greenstone belt outcrop along the northern edge of the Wabigoon (Kenora) Subprovince, from East Braintree to West Hawk Lake (Fig. 3). The rocks are predominantly pillowed and massive metabasalts containing lensoid masses of hornblende gabbro and diorite within them. The rocks between Star Lake and West Hawk Lake are volcanogenic metasediments.

Pegmatite dykes are intruded both as thin sheets along dilational subhorizontal cross-fractures and as nearly concordant dykes subparallel to the foliation of the metavolcanics. A few smaller dykes are intruded into transverse vertical fractures. Rare-element minerals in pegmatites show a regional zonation, as Li and Be occur in the Glenn area, and Mo and W occur in pegmatites from Barren Lake to Star Lake.

In the northern part of the area, between Telford and Caddy Lake, pegmatitic sills or *lits* are interlayered with a complex of granitic gneisses, granite, syenite, and amphibolite, all probably derived from mainly sedimentary and minor volcanic rocks. Small pegmatite dykes transect granite and gneiss. Uranium and thorium mineralization is present in both the pegmatite sills and dykes, and also as a low level dissemination in some of the granite and gneiss.

The major granitic rocks in the region are the metasomatic Frances Lake Suite of porphyroblastic granodiorite and associated quartz diorite, the syntectonic West Hawk porphyritic granodiorite, and the post-tectonic differentiated Falcon Lake stock. Those rocks, and the Caddy Lake-Telford rocks, form the southern part of the Winnipeg River Batholithic Belt (Beakhouse, 1977).

All the rare-element pegmatites except the Deer pegmatite occur in rocks close to the contact with the Frances Lake Suite. Although genetic relationships between the pegmatites and parent intrusives have not been established, some relationship to the Frances Lake Suite, because of their obvious proximity, has been suggested by several geologists. However, detailed geochemical study of the rocks is necessary before relationships can be defined.

Lucy Pegmatite

The Lucy pegmatite, a zoned body containing spodumene and beryl, is located 11 km southwest of Falcon Beach and 0.5 km north of the Trans-Canada Highway (Fig. 4). The deposit was staked in 1943 by Hans Apolony, and the pegmatite was trenched. The claim group was optioned to East Braintree Lithium Corporation Limited in 1953, and later to North American Rare Metals Limited. It was drilled in 1955 and 1956. (See Mineral Inventory Card 52 E/11 Li 1, in Bamburak, 1980).

The Lucy pegmatite is intruded into metavolcanics that strike 80° and dip 80° south (Fig. 5). It forms an apical portion of a large, hummocky, subhorizontal pegmatite sheet, and is exposed along a cliff face over a length of 20 m and a height of 3 m. The cliff outcrop is located 130 m at 340° from the northwestern corner of the "black granite" stone quarry once worked by Joe Wirth.

The upper contact dips 45° to the north, irregularly to the south, and plunges 23° to the east. The zoned structure is exposed best in rock cuts and trenches along the lower part of the ridge (Fig. 5).

The upper border zone is a fine- to medium-grained mixture of quartz + albite + muscovite + tourmaline.

The upper wall zone consists of pink and white albite, black tourmaline, muscovite, glassy quartz, and minor beryl. Blue tourmaline occurs both as radiating clusters and in aggregates of short acicular grains. Pale milky green beryl crystals up to 12 mm across are present. Muscovite has a habit similar to the divergent clusters of tourmaline crystals, and both are cut by narrow stringers of quartz.

White, saccharoidal and finely acicular albite occurs as a lens between the wall zone and the upper intermediate zone. Patches of red iron oxide are associated with small grains of magnetite.

Spodumene occurs in several places along the cliff face, and also in a pit 1 m deep at the south end of the cliff. It occurs in the intermediate zones that enclose the quartz core. Spodumene crystals up to 50 cm long are greyish white where fresh. Glassy quartz occurs in wedge-shaped masses between divergent slabs of spodumene and is associated with fine grains of greenish apatite. The spodumene that occurs along a cross-fracture cutting the northern part of the outcrop (Fig. 6) has a chalky white appearance; associated with it are tabular masses of a green mixed-layer silicate.

A small quartz core, consisting of more than 90 per cent quartz, is exposed near the centre of the cliff face. It contains spodumene laths and pink, slightly vuggy albite.

The intermediate zone exposed above the quartz core continues around it and is exposed in a pit southwest of and below the quartz core.

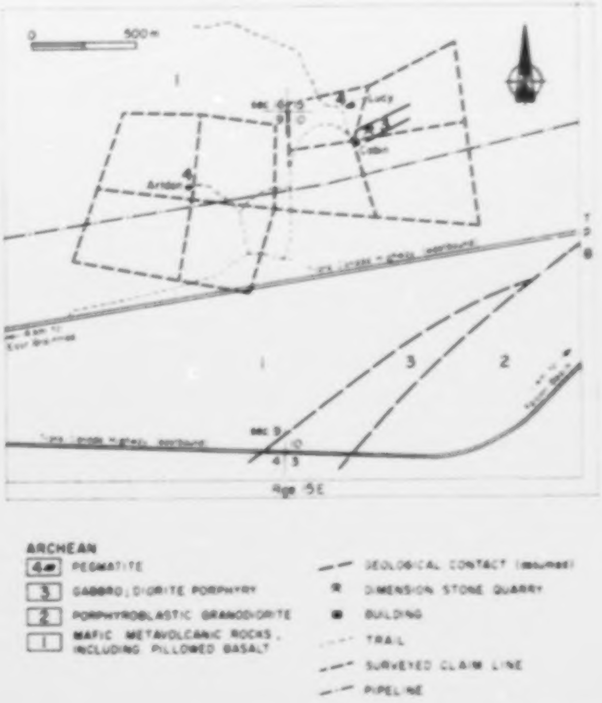

0
500 m
1
sec 9
10
Lucy
4
Ardon
1
3
2
sec 9
10
4
3
Rge 9E
ARCHEAN
4 PEGMATITE
3 GABBRO, DIORITE PORPHYRY
2 PORPHYROBLASTIC GRANODIORITE
1 MAFIC METAVOLCANIC ROCKS, INCLUDING PILLOWED BASALT
GEOLOGICAL CONTACT (assumed)
DIMENSION STONE QUARRY
BUILDING
TRAIL
SURVEYED CLAIM LINE
PIPELINE

Figure 4: Location of Lucy and Ardon pegmatites (from air photo A20220-164).

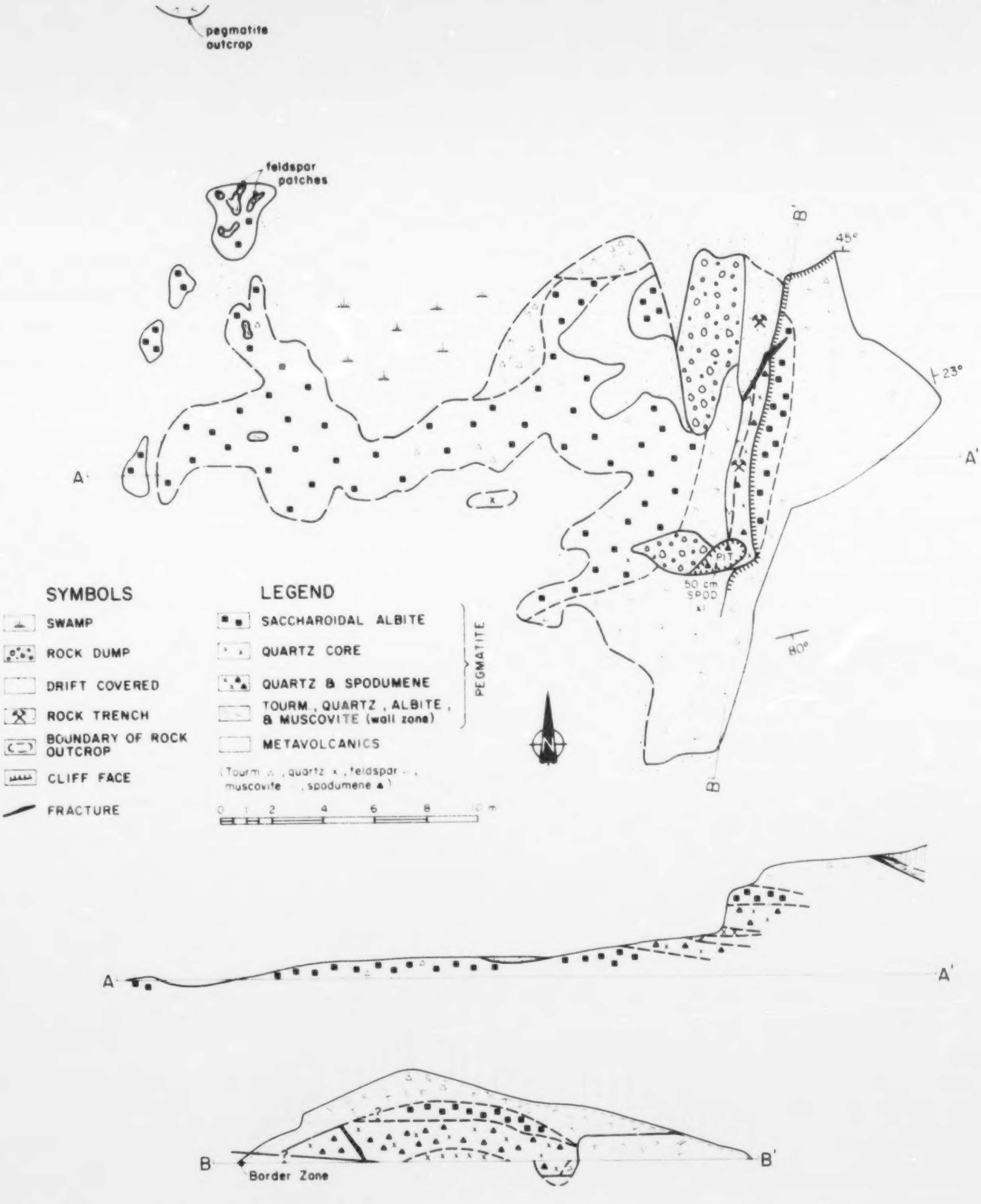

pegmatite outcrop
feldspar patches
B'
45°
23°
A
A'
PIT
50 cm SPOD x1
80°
B
SYMBOLS
SWAMP
ROCK DUMP
DRIFT COVERED
ROCK TRENCH
BOUNDARY OF ROCK OUTCROP
CLIFF FACE
FRACTURE
LEGEND
SACCHAROIDAL ALBITE
QUARTZ CORE
QUARTZ & SPODUMENE
TOURM., QUARTZ, ALBITE, & MUSCOVITE (wall zone)
METAVOLCANICS
PEGMATITE
(Tourm △, quartz x, feldspar ⌐, muscovite ⌐, spodumene ▲)
0 1 2 4 6 8 10 m
N
A
A'
B
B'
Border Zone

Figure 5 *Plan and cross-sections of Lucy pegmatite*

The western part of the outcrop consists mainly of saccharoidal albite, containing bands of granular quartz. The albite is cut by stringers of black tourmaline crystals. Inclusions of metavolcanics show various stages of replacement, ranging from well-defined inclusions to completely replaced ghosts. Some inclusions are bordered by a black tourmaline-bearing zone 1 to 2 cm wide.

Results of the drill program

In 1955, a total of 2986 m in 48 holes was drilled. The results indicate that pegmatite underlies an area 150 m wide and 230 m long (N-S), around the exposed portion of the Lucy pegmatite (Fig. 7). The pegmatite is a somewhat hummocky sheet, possibly faulted or in two layers. Two thicker apical parts were outlined, the more southerly one being the Lucy exposure. The northern apex is so close to surface that outcrop might be present in that area. Mulligan (1965) reported, "Pieces of spodumene, white amblygonite, pale lilac mica, and beryl are scattered near a small water-filled pit about 300 feet [90 m] farther north" from the Lucy pegmatite outcrop. The subsurface pegmatite sheet dips to the south, and may pinch out to the north.

In the logs for several holes (ESS file 92160) an upper spodumene- and lepidolite-bearing pegmatite is reported to overlie an albitic aplite (saccharoidal albite) layer of variable thickness. Chemical analyses are not reported in the assessment work, but a report in the Northern Miner of May 18, 1961, indicated:

- average of 3 holes (8, 9, 10): 1.55% Li_2O over a core length of 9.45 m;
- hole 14: 1.30% Li_2O over 12.6 m;
- hole 24: 2.16% Li_2O over 12.2 m, of which the first 4.57 m was 3.51% Li_2O.

In that report, reserves were stated to be 226,800 tonnes grading 1.75% Li_2O. Spodumene is the only abundant lithium mineral observed in the Lucy outcrop, and is noted in most of the drill logs. Lepidolite and Li-muscovite are reported in a few drill logs. The drilling reached a maximum depth of 80 m.

The Lucy pegmatite is of special interest as it is the only known dyke in the Falcon Lake area that is subhorizontal. Its complex mineralogy suggests a fairly advanced degree of fractionation.

Artdon pegmatite

A spodumene-bearing pegmatite outcrops in the southeastern part of l.s. 15, sec. 9, tp. 10, rge. 15EPM, and is located 885 m at 250° from the Lucy pegmatite.

Four claims were staked in the area in 1937, and some pits were excavated. The pegmatite was restaked in 1943 by A.B. Scott with 4 claims of the Artdon Group. They were optioned to Sherritt Gordon Mines Limited, who drilled 18 holes totalling 1159 m. The occurrence of pegmatite was reported as "spotty" and the option was dropped. The property was held by Lithium Corporation of America, but the claims were cancelled in 1979.

The Artdon pegmatite outcrop is 10 by 18 m (Fig. 8). A central 1.8 to 3 m septum of metavolcanics transects the outcrop, and the interior contacts have variable dips of 55° south to 75° south. The outer contacts are not exposed, but the base line for the drill holes had a bearing of 53°02', probably close to the strike of the dyke; the regional schistosity strikes 70°, so the pegmatite may be slightly discordant.

In the northwestern part of the outcrop, a water-filled trench 3 by 5.8 m and a few metres deep, exposes different zones of the pegmatite. Blue tourmaline occurs with cleavelandite. A fine grained quartz + albite unit is present. One of two major zones consists of blocky feldspar + quartz + mica. The feldspar is up to 24 cm across, and is dominantly white microcline, grading to pink and red along cleavage traces and crystal edges; some is blocky pink perthite. Steel grey curvilamellar lithian muscovite occurs in patches 6 to 10 mm across. Small crystals of greenish-white and white beryl are most abundant in this zone. Irregular columnar masses of milky white beryl occur in the blocky perthite-quartz zone.

The second major zone, comprising spodumene + quartz, is best seen in the few broken blocks of pegmatite that remain around the trench (Fig. 9). Spodumene occurs in clusters, with individual crystals 15 to 20 cm across. Most of it is white; some patches of red iron oxide occur in the matrix. Quartz occurs in wedge-shaped masses between divergent laths of spodumene, 6 to 13 mm thick. One curved spodumene crystal shows definite distortion, but, in general, stress effects are not prevalent. A concentration of quartz in the northeastern part of the trench may represent a poorly defined quartz core.

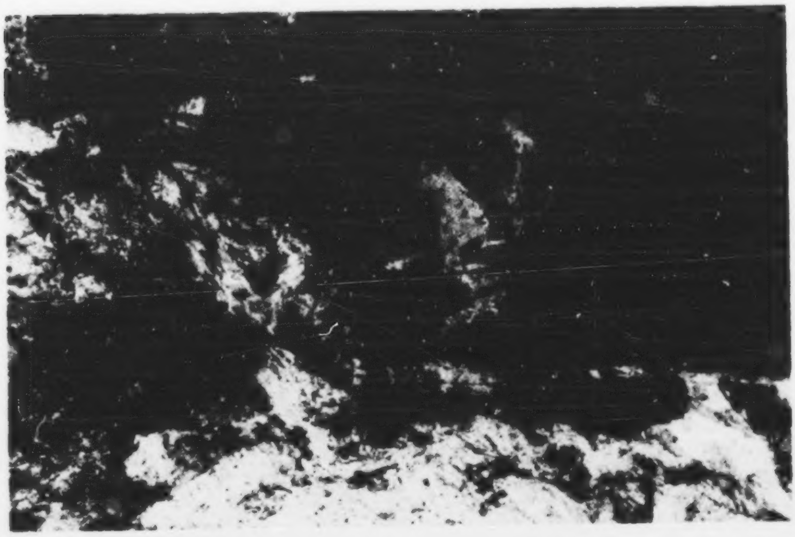


Figure 6. *Coarse spodumene with chalky alteration along fracture. Lucy pegmatite. Hammer is 33 cm long.*

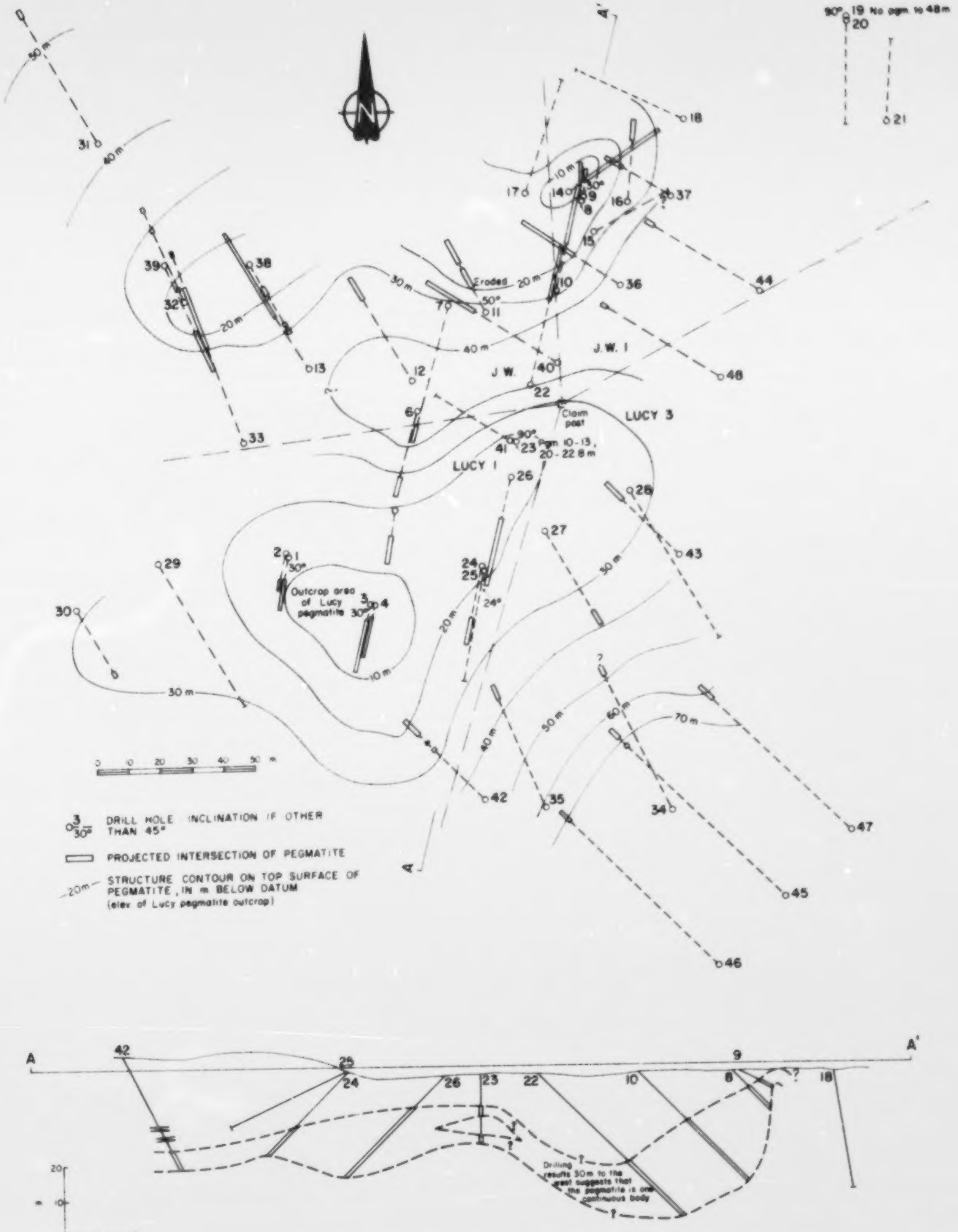

90° 19 No pgm. to 48m
20
21
18
31
50 m
40 m
17
14
10 m
9
8
16
37
15
39
38
32
20 m
30 m
Eroded
20 m
50°
7
11
10
36
44
13
12
40 m
J.W.
40
J.W. 1
48
22
Claim post
LUCY 3
6
90°
41
23
Pgm 10-13, 20-22.8 m
33
LUCY 1
26
28
27
43
29
2
1
30°
24
25
Outcrop area of Lucy pegmatite
3
30°
4
30
26°
20 m
30 m
10 m
30 m
50 m
60 m
70 m
40 m
0 10 20 30 40 50 m
42
35
34
47
45
46
A
A'
DRILL HOLE. INCLINATION IF OTHER THAN 45°
PROJECTED INTERSECTION OF PEGMATITE
STRUCTURE CONTOUR ON TOP SURFACE OF PEGMATITE, IN m BELOW DATUM (elev. of Lucy pegmatite outcrop)
20m
Drilling results 30m to the east suggests that the pegmatite is one continuous body
m
20
10
0
10
20
m

Figure 7: *Lucy pegmatite: drill hole locations, structure contour and section. (Drill hole data from ESS file 92160).*

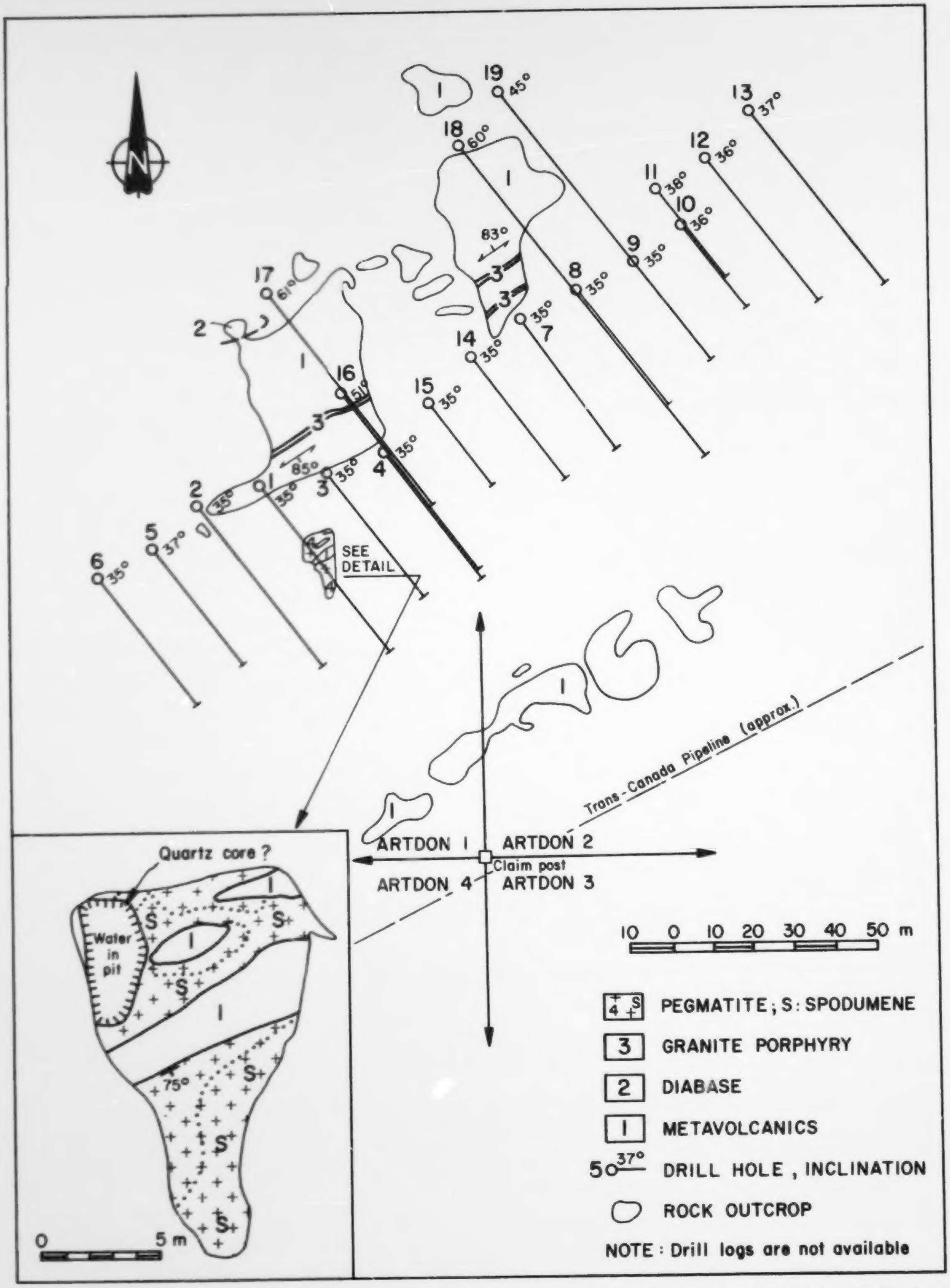

N
19 45°
13 37°
18 60°
12 36°
11 38°
10 36°
9 35°
8 35°
83°
17 61°
7 35°
14 35°
15 35°
16 51°
4 35°
85°
3 35°
1 35°
2 35°
5 37°
6 35°
SEE DETAIL
1
2
3
Trans-Canada Pipeline (approx.)
ARTDON 1
ARTDON 2
Claim post
ARTDON 4
ARTDON 3
10 0 10 20 30 40 50 m
Quartz core ?
Water in pit
S
75°
0 5 m
4 S PEGMATITE; S: SPODUMENE
3 GRANITE PORPHYRY
2 DIABASE
1 METAVOLCANICS
5 37° DRILL HOLE, INCLINATION
ROCK OUTCROP
NOTE: Drill logs are not available

Figure 8: *Plan of outcrops and drill holes, Artdon pegmatite (modified from ESS file 91557, and sketch by F.D. Shepherd in MRD files).*

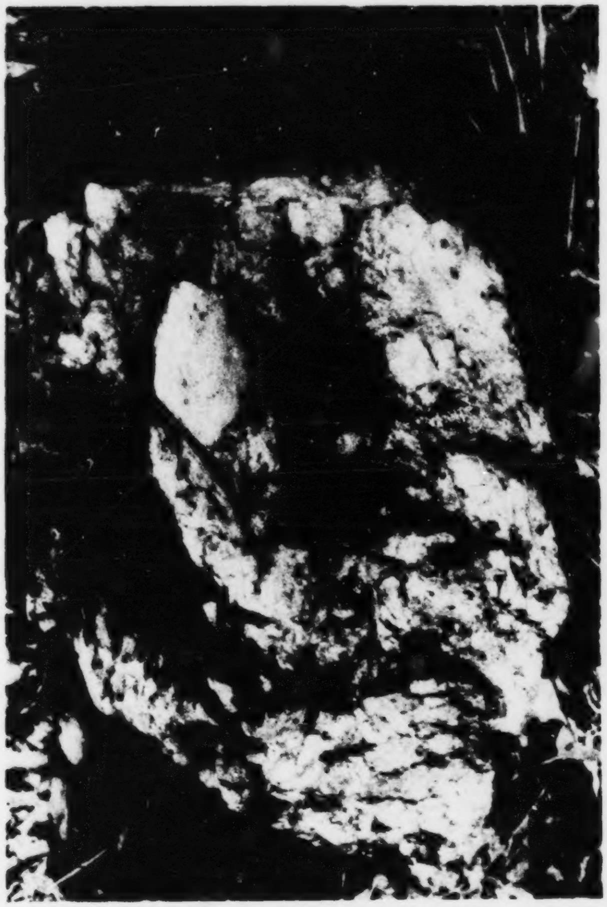


Figure 9: Coarse spodumene crystals. Artdon pegmatite; lens cap is 54 mm in diameter.

In the southern part of the exposure, a small, shallow pit exposes the contact with the volcanic septum. The pegmatite is fine grained at the contact. A medium grained quartz + tourmaline zone 0.6 m wide separates the septum from another spodumene + quartz zone.

In the report of assessment work on the Artdon pegmatite, ESS file 91557, only a plan of the drill holes is included. It shows the location of 19 holes over a length of 200 m along the base line. Information on the reserves and grade of this deposit has not been reported. Where exposed, the dyke has a combined minimum width of 15 m and spodumene is reasonably abundant.

Subsurface pegmatite on the Alan 27 claim

An occurrence of pegmatite, possibly containing spodumene, was noted in the file of assessment work for the Alan 27 claim (ESS file 91087). The claim is located 12 km southwest of East Braintree, in l.s. 11, sec. 16, tp. 7, rge. 13 EPM, along the projected northern edge of the West Hawk Lake greenstone belt (Fig. 2).

A drill hole was located 91.5 m south and 198.2 m east of the #4 claim post, and has a bearing of 320°, and a dip of 50°. It intersected a "red quartz-feldspar muscovite pegmatite" from 42.7 to 60.5 m, immediately below the overburden. In the interval from 48.5 to 48.9 m (159-160.5 feet), the drill log lists "white, finely laminated mineral (intergrowth of quartz and feldspar?)". Samples are not available, but it is possible that the mineral is spodumene with quartz. The drill hole was sited on a magnetic anomaly located in an aeromagnetic survey. Pyrite-pyrrhotite mineralization and some magnetite were intersected in metasediments and basic metavolcanics in the drill program completed in 1962.

Molybdenite pegmatites in the Falcon Lake area

Molybdenite deposits in pegmatites, quartz veins, and granitic dykes in the Falcon Lake area were known as early as 1900, when the original discovery was made by William Gordon (Eardley-Wilmot, 1925, p. 54) who later relocated them with G.B. Hall. In 1917, James Cuddy staked the Gull (Molly) claim and Hall staked the Tomboy (Bendum) claim. Test pits were blasted in some pegmatites, and a shaft was sunk on the dyke on the Tomboy claim. Scheelite has been reported in some dykes and veins, but commercial production was never attained.

Concentration of the molybdenite crystals in large clusters enabled the material to be hand-cobbed during the 1917-1918 period when prices for molybdenum were high (DeLury, 1927). A single 225 gm crystal from the Lucky Jack claim assayed 50.15% Mo and 0.16 oz. of gold per ton (ESS file 91082). In places, the overall molybdenite content was reported as one per cent. The Falcon Lake Mining and Milling Company was formed, and altogether 900 gms of pure flake molybdenite and 450 kg of 10 per cent ore (from 225 tonnes of rock extracted) were produced (Eardley-Wilmot, 1925).

The molybdenite properties have not been worked in at least 40 years, except for the Molly pegmatite, where some trenching was done in the late 1960s. Many of the original pits are overgrown and difficult to locate, and some may have been filled in. Also, locations of some of the dykes are not precisely shown on existing maps. Consequently, the following report is based on published accounts, and on observations made on the Molly and Bendum deposits. Information on other molybdenite-bearing pegmatites is included in the Appendix.

The dykes containing molybdenite occur in a belt extending northeasterly for 6.5 km from the Molly claim to west of Star Lake. They occur within pillowed, steeply dipping metavolcanics and basic chloritic and hornblende schists, close to the contact with the Frances Lake pluton of pink to grey porphyroblastic granodiorite containing large ovoid microcline blasts.

Most of the molybdenite dykes are conformable to the enclosing schists, but some transect the schist at a low angle, and others are intruded into fractures perpendicular to the schistosity. DeLury (1917) reported the best showings of molybdenite are in the concordant dykes, within "a few hundred feet" of the schist-granodiorite contact. He noted the molybdenite occurs in a variety of forms:

"1. six-sided prisms tapering slightly towards the ends;
2. radiating lamellar masses;
3. fine grained massive;
4. lamellae and small flakes." (DeLury, 1917).

The first two types are more abundant and occur in coarse- to medium-grained pegmatite. In some of the dykes, aplite phases contain small crystals and flakes of molybdenite (ESS file 91082).

Molybdenite is rarely seen in outcrop, and trenching is necessary to determine the content of a deposit.

Molly and Bendum claims (N ½ sec. 33 and 34, tp. 8, rge. 16 EPM)

The Molly, and the Bendum adjoining to the northeast, are surveyed claims, approximately 2.4 km north of the west end of Falcon Lake. Access to the claims is along a snowmobile trail extending northeastward from the riding academy north of the Falcon Lake turn-off.

On the Molly claim, a pegmatite-aplite dyke, 1.2 to 3 m wide, striking 50° to 60°, and dipping 75° to 82° southeast, was examined in detail (Fig. 10). Three pits have been blasted in the main pegmatite, exposed over 36 m. The basic volcanic schists north of the west pit strike 50°, and dip 85° northwest; south of the pit, they strike 50° and dip 80° southeast.

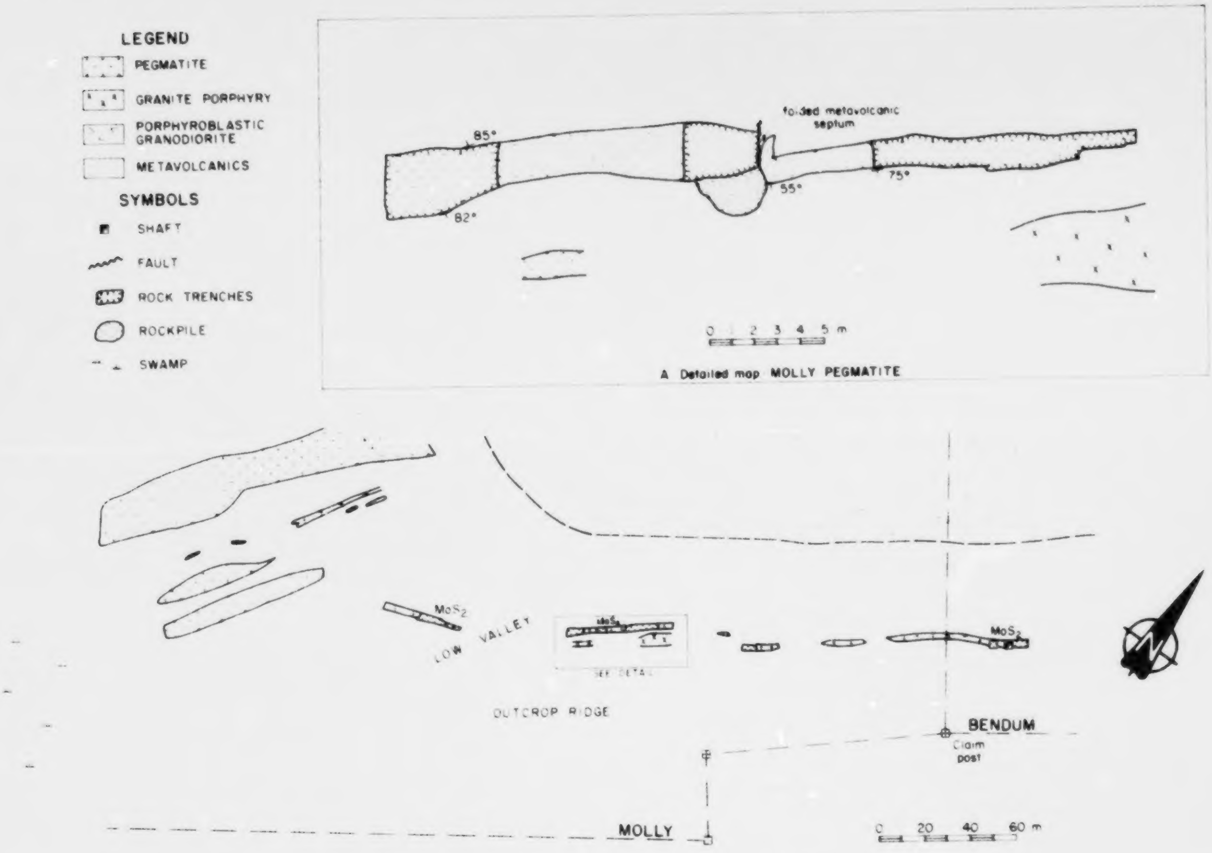


Figure 10 *Molly and Bendum pegmatites: plan of trenches. (Base map adapted from ESS file 91082).*

The western pit exposes fine grained pegmatite consisting of pink and grey microcline; aplite phases containing abundant small red garnets occur along the north contact. Coarser grained pink K-feldspar + quartz contains patches up to 5 cm across of very fine grained red garnets in an aplitic phase. Only a few grains of molybdenite were noted in this pit. Small grains of ixiolite and of columbite-tantalite, identified by X-ray methods, occur in the Molly pegmatite.

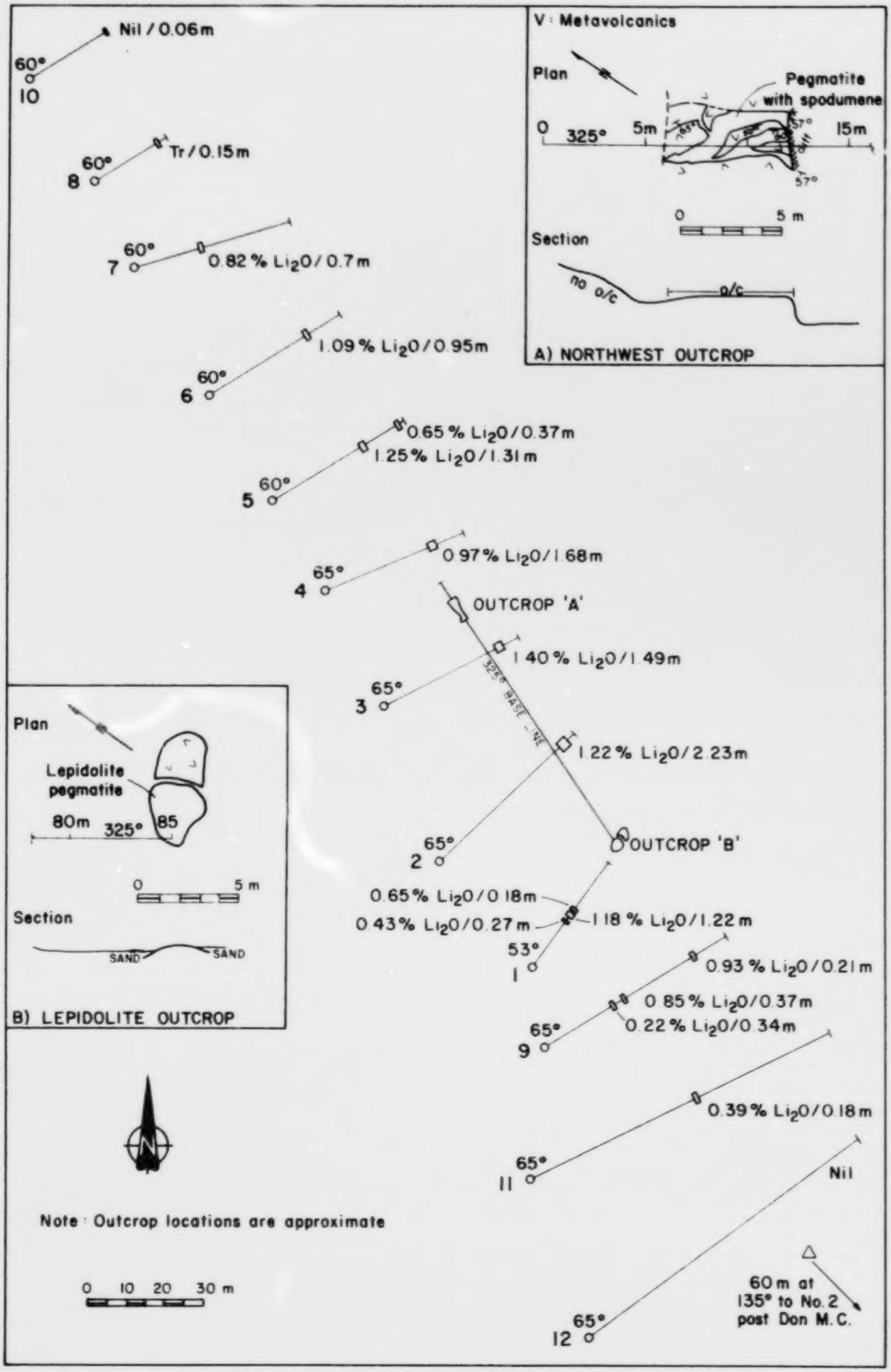
At the eastern end of the central pit, a fault has resulted in a small offset in the dyke; the metavolcanic rock has been folded into a curved septum in contact with the pegmatite.

In the eastern pit, the pegmatite shows banding subparallel to the contacts, caused both by textural changes from pegmatite to aplite, and by layers of small red and dark brown garnets. One mass of lamellar molybdenite, 5 cm long, 2.5 cm wide, and 12 mm thick, was noted within a block of the aplitic phase in a rock pile beside the pit. Yellow ferrimolybdenite(?) stain and a very fine grained green mica are associated with the molybdenite. Other molybdenite crystals were found in small rock piles beside the pits. Some fine- to medium-grained zones consisting predominantly of quartz are present in the eastern pit.

DeLury (1917) reported molybdenite in lamellar masses up to 50 to 75 mm in diameter from the Molly pegmatite, as well as aggregates of fine grained molybdenite, some several centimetres in diameter, in a crosscutting dyke.

Molybdenite-bearing pegmatite outcrops 65 m at 260° from the western end of the main trench. Flakes of molybdenite up to 1 cm long were noted in a shallow trench; several clusters occur in blocks of pegmatite beside the trench. A possible continuation of this pegmatite outcrops 85 m at 295° from the trench.

On the Bendum claim, 70 m northeast at 60° from the eastern pit on the Molly, the site of an old shaft and a trench extending to the west were located. Previous reports indicate the shaft was sunk at least 6 m deep into a pegmatite dyke 1.8 m wide, striking 60°, and dipping almost vertically. The excavation around the pit and trench is 9 m long and up to 3.7 m wide, and is 2.4 m deep to the level of the water. Samples of the pegmatite from the rock pile beside the pit indicate both a coarse grained predominantly albite pegmatite, with biotite, and a fine grained quartz + mica + feldspar pegmatite. One 10 mm needle of black tantalite-columbite in this was identified by X-ray methods and one beryl crystal was found. A small pile of broken pegmatite containing flakes and grains of molybdenite was noted but it appears most of the visible high-grade material has been removed. Thin lamellar masses of molybdenite up to 35 mm long and 12 mm wide were collected. DeLury (1917) reported the dyke on the Bendum claim is 0.9 to 2.4 m in width, and contains some large crystals and lamellar masses of molybdenite. He reported "a fine grained garnetiferous phase forming a band from one to two feet in width carries an abundance of small grains and scales of molybdenite" (ESS file 91082).



Nil / 0.06m
60°
10
60°
8
Tr / 0.15m
60°
7
0.82 % Li_2O / 0.7 m
1.09 % Li_2O / 0.95m
60°
6
0.65 % Li_2O / 0.37m
1.25 % Li_2O / 1.31 m
60°
5
0.97 % Li_2O / 1.68m
65°
4
OUTCROP 'A'
1.40 % Li_2O / 1.49m
325° BASE LINE
65°
3
1.22 % Li_2O / 2.23m
65°
2
OUTCROP 'B'
0.65 % Li_2O / 0.18m
0.43 % Li_2O / 0.27 m
1.18 % Li_2O / 1.22 m
53°
1
0.93 % Li_2O / 0.21 m
0.85 % Li_2O / 0.37m
0.22 % Li_2O / 0.34m
65°
9
0.39 % Li_2O / 0.18 m
65°
11
Nil
65°
12
60 m at 135° to No. 2 post Don M.C.
N
Note: Outcrop locations are approximate
0 10 20 30 m
V: Metavolcanics
Plan
Pegmatite with spodumene
0
325°
5m
15m
57°
57°
0
5 m
Section
no o/c
o/c
A) NORTHWEST OUTCROP
Plan
Lepidolite pegmatite
80m
325°
85
0
5 m
Section
SAND
SAND
B) LEPIDOLITE OUTCROP

Figure 11: *Plan of drill holes and outcrops, Deer pegmatite; drill results from ESS file 91072.*

Deer pegmatite, West Hawk Lake

The first reported occurrence of lithium minerals in Manitoba, about 1916, was of lepidolite (DeLury, 1926, MRD files) in the pegmatite dyke close to the southwest shore of West Hawk Lake. Wright (1932) describes the occurrence, on the Deer mining claim. He reports the dyke consists of an intimate mixture of quartz, albite, lepidolite, and spodumene. Some small crystals of pink tourmaline were noted.

The Deer pegmatite dyke is located 305 m southwest of West Hawk Lake, in l.s. 10, sec. 16, tp. 9, rge. 17EPM, in a resort area. It is exposed mainly on the property of West Hawk Motel, and cabins are located along the strike of the dyke. In 1956, the pegmatite was drilled by Cobalt Consolidated Mines Ltd. The work consisted of 12 drill holes, totalling 608 m (ESS file 91072).

The pegmatite was exposed in two outcrops in 1972 (see Fig. 11 for dimensions and orientation). In the northwestern area, the overburden has been removed and the pegmatite consists of cleavelandite, quartz (some of which is of a pale rose colour) and some patches of purplish lithian muscovite. The pegmatite contains large inclusions of fine grained massive muscovite. Both the contacts of the dyke and the inclusions are rimmed with a narrow zone of aplite. Spodumene crystals and pink tourmaline have been reported from that outcrop area by Wright (1932) and McCartney (1930; see Fig. 12); according to McCartney, vertically oriented blades of greenish spodumene are exposed on edge as thin laths, some cut by quartz and feldspar stringers. They are as much as 25 cm long, and weather red to greenish brown. This occurrence could not be located during the present study.

At a distance of 85 m at a bearing of 145°, a low outcrop of the pegmatite, in contact with fine grained metavolcanics, is exposed at the west end of a small ridge surrounded by sand. The pegmatite appears to consist of about 50 per cent of patches of lilac-coloured lithian muscovite, mixed with sugary to fine grained quartz.

The total content of mica is probably less, as the micaceous patches are better preserved in outcrop than the enclosing quartz + albite pegmatite. The pegmatite there has a width of 3 m; the south contact is not exposed. The exposure is 76 m north of Highway 44. (In 1983, it was noted that a cottage has been built over that outcrop).

An analysis of a sample collected from the micaceous outcrop showed 0.07% Ta_2O_5 and 0.024% Sn (D.L. Trueman, pers. comm., 1979).

In the 1956 drilling, 12 holes over a strike length of 330 m indicated the dyke continued for a length of 305 m, of which a central 244 m portion contained lithium values. Assays ranged from 0.82% Li_2O over 0.7 m to 1.40% over 1.49 m, in this interval. Some subdivision of the pegmatite in two of the holes is reported, but is possibly the result of inclusions of volcanic rock.

The tonnage outlined is small. In the central 183 m of the drilled zone, the deposit contains 21 200 tonnes grading 1.19% Li_2O to a depth of 30.5 m.

Other pegmatites close to the Deer pegmatite

Stockwell (in Wright, 1932, p. 126) reported two other lithium-bearing dykes nearby. "One is 4,400 feet [1,341 m] north 25 degrees west of the dyke on the Deer claim and the other is 1,200 feet [366 m] south 30 degrees east of the same dyke ... They are composed of albite and quartz with a small amount of lepidolite and, in one of them, a small amount of pink tourmaline which is not of gem quality. The dykes are of no economic value."

Figure 12: ***Spodumene in thin bladed crystals, oriented vertically to the exposure surface, Deer pegmatite. Scale is 16 cm long. Photograph by McCartney (1930).***

Radioactive minerals in pegmatites, Caddy Lake-Telford area

Pegmatites containing disseminations of radioactive minerals have been investigated at intervals since 1948. They occur within a narrow belt of rocks extending from Telford to Caddy Lake, generally close to Highway 44 (Fig. 13). The zone is entirely within Whiteshell Provincial Park.

Prospector Charles Letain found evidence of radioactive minerals in the area and staked claims in 1948. Whiteshell Uranium Syndicate explored the area in 1950. Results of that work have been published in Springer (1952, p. 21) and Lang (1952, p. 116). Detailed surveys of some of the deposits are in ESS file 91082, for the Libby, Found, and other claims. Analyses of channel and bulk samples generally showed a U_3O_8 content ranging from 0.01 to 0.14%; selected samples analyzed 0.18 to 0.30% U_3O_8. One sample contained 0.22% U_3O_8 and 0.53% ThO_2.

The radioactive minerals identified are cyrtolite, thorite, uraninite, and doubtful allanite and uranothorite (Lang, 1952).

The area from Rennie to Caddy Lake was restaked in 1976 by Groundstar Resources Limited. Detailed geological mapping and a ground scintillometer survey were carried out on a ten claim-block area. The results, indicating "a considerable amount of radioactive pegmatite on the property" (McCannell, 1976) are presented in ESS file 92216. A total of 23 areas with radioactive anomalies are plotted on four map sheets at a scale of 1:2400 and are the most detailed maps available.

The pegmatites occur as *lits* or sills interbedded with paragneiss, syenite, quartzite, tonalite gneiss, biotite gneiss (in part schistose) and granite gneiss, probably all derived from sediments (McCannell, 1976), and also with amphibolite. Foliation and remnant sedimentary structures strike 285° and dip 10° to 35° north. The regional geology is described by Janes (1977), McCannell (1976) and Springer (1952). Michalkow (1954) examined the pegmatitic rocks in the Lily Pond area.

Radioactive minerals occur mainly in the pegmatitic sills, but some are within schist or gneiss near the pegmatite contacts. In the porphyroblastic rocks, the pegmatites occur as narrow transcurrent dykes. Although radioactivity is strong in places, the dykes are too small to be economic. In addition to the Telford-Caddy Lake belt, another belt of metasediments and metavolcanics occurs as a topographically low area parallel with the main belt, but farther south. Some pegmatites in this belt contain radioactive anomalies, as noted on the maps by McCannell (1976). A third belt is present from the south end of Ross Lake to Beyak Lake, as shown in Figure 13.

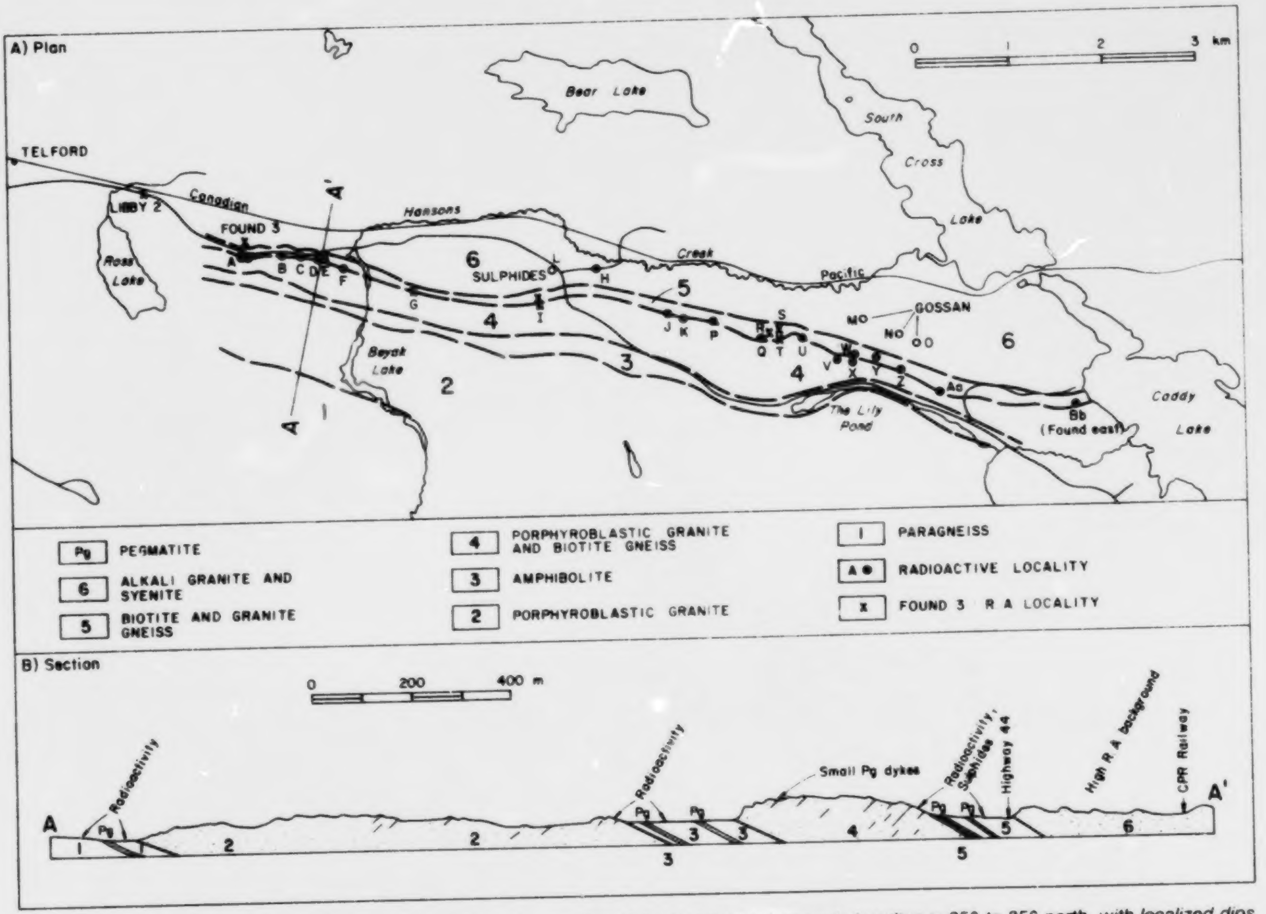

A) Plan
0 1 2 3 km
Bear Lake
South Cross Lake
TELFORD
LIBBY 2
Canadian Pacific
FOUND 3
Hansons Creek
Ross Lake
A B C D E F G H I J K P Q T U S R V W X Y Z Aa Bb
SULPHIDES
GOSSAN
MO NO OO
(Found east)
Beyak Lake
The Lily Pond
Caddy Lake
A A'
6 5 4 3 2
Pg PEGMATITE
6 ALKALI GRANITE AND SYENITE
5 BIOTITE AND GRANITE GNEISS
4 PORPHYROBLASTIC GRANITE AND BIOTITE GNEISS
3 AMPHIBOLITE
2 PORPHYROBLASTIC GRANITE
1 PARAGNEISS
A ● RADIOACTIVE LOCALITY
x FOUND 3 R A LOCALITY
B) Section
0 200 400 m
Radioactivity
Small Pg dykes
Radioactivity, Sulphides
Highway 44
High R A background
CPR Railway
A A'
Pg 1 2 3 4 5 6

Figure 13: *Radioactive localities, Telford-Caddy Lake area. Dip of the bedding and gneissic banding is 25° to 35° north, with localized dips of 10°. Geology from McCannell (1976).*

The occurrences in the main belt are noted in Figure 13 and are listed in Table 2. Details of some of the occurrences that were examined in 1972 are described below; the showings were checked with a portable geiger counter.

Libby 2 claim

An outcrop 2 to 3.5 m high, in a road cut on the south side of Highway 44, 11.7 m east of Rennie, consists of biotite schist with interbeds of granitic to pegmatitic layers. The beds dip 20 to 30° north. Some areas with low radioactivity were noted.

Found, Found 2 and Found 3 claims

In the Hanson Creek area, the rock sequence consists of alternating layers of nearly flat-lying pegmatite and biotite schist. South of Highway 44, the pegmatite on the Found claim is exposed in low, rounded outcrops which have been trenched to a shallow depth. The exposed pegmatite layer is heavily iron-stained. Near the western end of the outcrop, molybdenite flakes up to 12 mm across occur along a fracture in the pegmatite, associated with pyrite and pyrrhotite. Moderately radioactive patches are common throughout the exposure and one area several metres square near the eastern edge has high radioactivity. Some coarse pegmatite, predominantly feldspathic, is exposed, but some interbeds are granitic.

On Found No. 3 claim, a high cliff occurs north of a curve in Highway 44. On the top of the ridge, the exposed rock is mainly a medium grained granodiorite that contains some coarse grained patches with low to moderate radioactivity; it is cut in places by pegmatite veinlets. In the cliff face, the granodiorite occurs *lit-par-lit* with metasedimentary quartz + feldspar + mica schist. The beds dip north at 15° to 20°. Some narrow pegmatitic veins lie parallel to the granitic *lits* material, but correlation of mild radioactivity with coarse grained phases was not evident. The basal part of the cliff outcrop is mainly granodiorite, and one granitic bed was moderately radioactive. If this material were to be quarried, a large amount of barren rock would have to be removed in order to recover the radioactive minerals.

Lily Pond area

Springer (1952) indicates several radioactive occurrences along or near the granodiorite-metasediment contact at the northern edge of the rock ridge to the north of the Lily Pond. Two pits (localities S and T, Fig. 13) were noted in the granodiorite, in which the "pegmatites" consist of coarse grained phases of the host rock, rarely more than 0.6 m wide. They strike approximately north, and fairly strong radioactivity was noted in the trenches. One flake of molybdenite 6 mm long was noted in the south trench. Clusters of biotite flakes are present in the pegmatite.

Thirteen areas with radioactive anomalies are reported by McCannell (1976), plotted as J, K, P to Z, and Aa, Figure 13. Some of these correspond with localities noted by Springer (1952).

Found claims, eastern group, Caddy Lake

A pegmatite dyke containing some radioactive mineralization is exposed part-way down the steep northern slope of a large ridge of granodiorite west of Caddy Lake. The pegmatite is located 60 m northwest of the turnaround on the south branch of the Caddy Lake road, and thence 240 m west through bush (Locality Bb, Fig. 13). The dyke contains mainly pink K-feldspar, some albite, quartz and biotite, and it intrudes the granodiorite. A short distance west, a trench exposes some pyrrhotite in mixed lithologies. The rocks are heavily iron stained; some low radioactivity was noted.

Beryl pegmatite north of Telford

An occurrence of beryl located northeast of Telford and south of the Canadian National Railway is shown on the map of Springer (1952), but is not discussed in the text of his report. Its location is south of the bend in the powerline that crosses NE ¼ sec. 28, tp. 10, rge. 16E (Fig. 3). The country rock is granodiorite and quartz diorite.

Table 2. Total radiation in counts per second, Telford-Caddy Lake

Anomaly	Maximum reading
Libby 2	750 cps
Found 3	1500
A	3000
B	520
C	1600
D	500
E	1100
F	1500
G	1400
H	(Gossan)
I	550
J	550
K	1700
L,M,N,O	(Gossan)
P	1350 cps
Q	1600
R	3850
S	4800
T	1250
U	4000
V	2400
W	1050
X	850
Y	3500
Z	1550
Aa	850
Bb	600

(Localities A to Bb from McCannell, 1976)

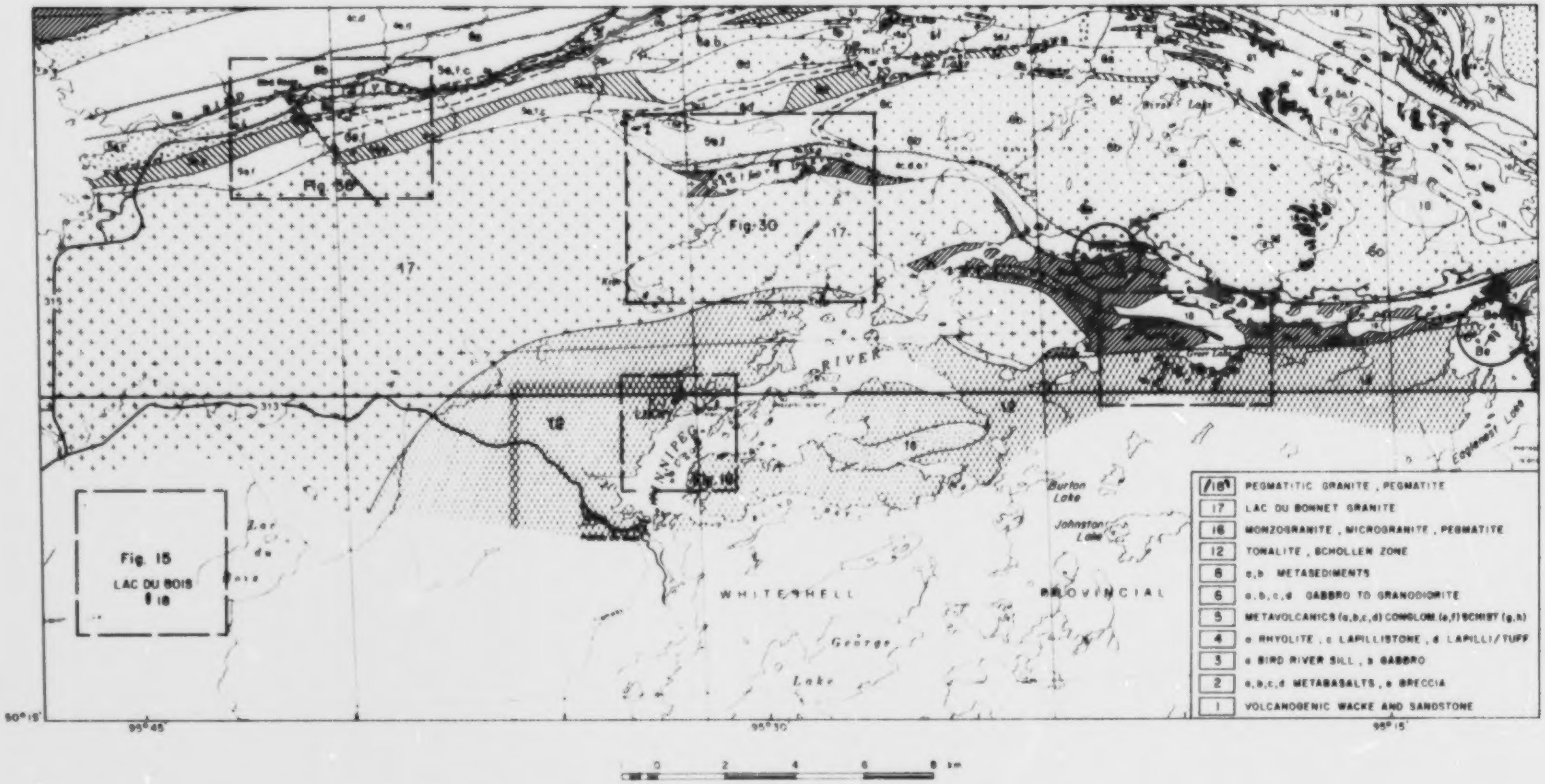


Fig. 56
Fig. 30
Fig. 15
LAC DU BOIS
18
Fig. 16
17
12
16
RIVER
WINNIPEG
WHITESHELL
PROVINCIAL
George
Lake
Burton Lake
Johnston Lake
Eaglenest Lake
Lac du Bois
315
313
Bird Lake
/18 PEGMATITIC GRANITE , PEGMATITE
17 LAC DU BONNET GRANITE
16 MONZOGRANITE , MICROGRANITE , PEGMATITE
12 TONALITE , SCHOLLEN ZONE
8 a,b METASEDIMENTS
6 a,b,c,d GABBRO TO GRANODIORITE
5 METAVOLCANICS (a,b,c,d) CONGLOM. (e,f) SCHIST (g,h)
4 a RHYOLITE , c LAPILLISTONE , d LAPILLI/TUFF
3 a BIRD RIVER SILL , b GABBRO
2 a,b,c,d METABASALTS , e BRECCIA
1 VOLCANOGENIC WACKE AND SANDSTONE
50°15'
95°45'
95°30'
95°15'
0
2
4
6
8 km

Figure 14: Location of pegmatites in Pointe du Bois-Winnipeg River region. Base map ER81-1-1 in Černý et al., 1981

RARE-ELEMENT PEGMATITES OF THE WINNIPEG RIVER/BERNIC LAKE/CAT LAKE AREAS

General statement

Rare-element pegmatites intrude the Rice Lake Group metavolcanic and metasedimentary rocks of the Bird River greenstone belt, and also the adjoining "schollen- to nebulite-textured quartz diorite gneiss" (Janes, 1976) that occurs along the north side of the Winnipeg River Batholithic Belt (Fig. 14). Both belts form part of the dominantly paragneissic English River Subprovince. Some pegmatites near Cat Lake intrude the greenstone belt, but others intrude the Maskwa Lake portion of the syntectonic Great Falls quartz diorite.

The geology of the region has been described by, among others, Springer (1949), Davies (1952, 1955, 1957), McRitchie (1971a,b), Wilson (1971), Janes and Malyon (1977), Breaks et al. (1978), Trueman (1980), Černý et al. (1981) and Ayres and Černý (1982). A comprehensive study of the pegmatites and their genetic relationship with granitoid intrusions has been made by Černý et al. (1981). The general geology, structural setting, metamorphism, and economic considerations are described also in that report, which includes much geochemical and mineralogical data.

The supracrustals into which the rare-element pegmatites are intruded underwent several periods of folding and were metamorphosed to the upper greenschist to amphibolite grades. Regional E-trending subvertical deep faults slice through the Winnipeg River and Cat Lake-Maskwa Lake regions, and pegmatite-generating granitoids and their pegmatite aureoles were emplaced during the final stages of faulting that opened dilational structural traps (Ayres and Černý, 1982). Three periods of granitoid intrusions are identified (op. cit.):

1) "Syntectonic diapiric tonalite", e.g. Maskwa Lake quartz diorite, accompanied the major synclinal folding in the Rice Lake Group rocks in the Bird Lake-Winnipeg River area. Only a few, barren pegmatites were intruded.
2) "Late tectonic potassic granites", e.g. parts of the Maskwa Lake batholith and the Lac du Bonnet "quartz monzonite" pluton, dissect and mantle the earlier tonalite. Minor pegmatites with U-Th mineralization and allanite are associated with their margins.
3) The most important intrusions in regard to rare- element pegmatites are the post-tectonic intrusions that were "intruded as small stocks and plugs along the east-trending subvertical faults segmenting and bounding the greenstone belt during a regional dilation including equigranular fine grained leucogranites, megacrystic pegmatitic leucogranite, sodic aplites and potassic pegmatite layers and pods. (These are) parental to most of the groups of mineralized pegmatite in the district" (Ayres and Černý, 1982).

The economic aspects of the rare-element pegmatites in the Winnipeg River-Bernic Lake-Cat Lake area are discussed in the section on "economic considerations" in Černý et al. (1981) in which the potential of the area is evaluated geochemically, and exploration target areas for each district are identified. The use of geochemical and geophysical methods of value in exploration for hidden pegmatites is discussed in papers by Trueman (1978) and Trueman and Černý (1982). The importance of structural controls, particularly the development of dilational fractures as related to geochemical evolution, including asymmetric fractionation trends of late-tectonic peraluminous granites and leucogranites, is described by Černý and Brisbin (1982). Brisbin and Trueman (1982) further relate orientation of late fractures into which the pegmatites are intruded to a critical depth above which vertical fractures will develop, and below which horizontal fractures occur. At the critical depth, fractures of diverse orientation occur. As the Tanco pegmatite is intruded into a horizontal-type fracture, this type of structural analysis can be a potentially useful technique, when combined with geochemical and other anomalies, in exploration work for rare-element pegmatites.

PEGMATITE DYKES IN THE POINTE DU BOIS AREA
(Lac du Bois to east of Lamprey Falls)

Numerous beryl-bearing pegmatites have been reported along or near Winnipeg River north and east from Pointe du Bois. Molybdenite occurs in pegmatite near Lac du Bois. A large pegmatite on the K-1 claim has been trenched, and two smaller dykes on the Lucky No. 3 claim have been drilled.

Other dykes outcrop on the shores and islands northeast of Pointe du Bois (G. Drawson, pers. comm., 1972), but only one was visible in 1972 because of high water levels behind Pointe du Bois dam. Three dykes were located by Černý et al. (1981), and their locations are shown in Figure 14. Most of these are small dykes intruded into the Winnipeg River Batholithic Belt, and they all contain small to medium-sized beryl crystals. The dykes range from aplite to medium- to coarse-grained feldspar + quartz pegmatite.

Wright (1932, p. 127) reported microcline pegmatites containing a few small beryl crystals in the Burton Lake area, 9.7 km slightly north of east of Pointe du Bois. This is approximately the region in which Sudbay Exploration and Mining Ltd. carried out work on the Art and Fred claim groups, staked in 1958. Some beryl-bearing pegmatites were trenched and some were diamond drilled; the company's name was changed to Sudbay Beryllium Mines Ltd. in 1960 and the claims were cancelled in 1962. The company acquired also a group of claims that had been staked by Red River Mining and Exploration Ltd. in 1959, on which beryl-bearing pegmatites had been found some 3.6 km south of Pointe du Bois (Northern Miner, Sept. 17, 1959). East of Pointe du Bois, a beryl-bearing pegmatite "to the south of Johnston Lake" is reported by Janes (1976). Maps showing locations of any of these dykes are not available.

Most of the pegmatites described in this section and in the following section on Greer Lake have been examined fairly extensively at various times, particularly between 1925 and 1957, for the occurrence of true gem-quality beryl. Various reports, mostly unpublished and in the Mineral Resources Division files, note the occurrence of the more common semi-opaque beryl in shades of white, pale blue, apple green, bluish green, greenish yellow, and yellowish green. A few small transparent crystals of a blue shade have been reported from the Clare 2 or "Jewel vein". A semi-translucent yellowish or golden beryl mass is reported from the Huron dyke; this mass is referred to as chrysoberyl in some reports. Small aquamarine beryl crystals occur also on the Jewel claim and on islands at the north end of Eaglenest Lake, and elsewhere.

Some of the beryl has been cut and polished and has provided a small source of semi-precious beryl. A large number of beryl crystals, primarily white, but with rare morganite-like mauve beryl, occur in the Tanco deposit at Bernic Lake.

More recently, mineralogical details of the beryl from Greer Lake and Bernic Lake are reported by Černý and Turnock (1975) and by Černý and Simpson (1977), respectively. Other references occur in Černý et al. (1981).

Lac du Bois pegmatite

Wright (1924, p. 99B) reported that small amounts of molybdenite were noted in pegmatite at a number of localities west of Pointe du Bois. He described a shallow prospect pit, 1.6 km west of Lac du Bois and 0.4 km north of the old City of Winnipeg railway, plotted near the southern side of sec. 28, tp. 13, rge. 15EPM. "A small andesite inclusion is present in the granite and a concentration of molybdenite occurs in a quartz-rich pegmatite along the andesite-granite contact."

A pegmatite dyke containing molybdenite was located in that area (Fig. 15). It is a north-striking dyke that outcrops over a length of 60 m along the northwestern edge of an extensive area of granitic rock which is cut by pegmatitic stringers and contains inclusions of metavolcanics in various stages of assimilation or granitization. One of these inclusions is in contact with the central to northern part of the dyke. A small trench, 2.3 m long and as much as 1.4 m deep, has been blasted across the pegmatite, and in it a few flakes of molybdenite, up to 1 cm long, are exposed in the east wall near the contact with the inclusion. Broken rock around the trench contains clusters of molybdenite up to 2.5 cm across. The molybdenite content is low. Translucent to smoky quartz and graphic quartz-feldspar occur in masses as much as 30 cm across. The pegmatite is of irregular width, but is narrow, averaging about 1 m, and the texture is variable along the dyke.

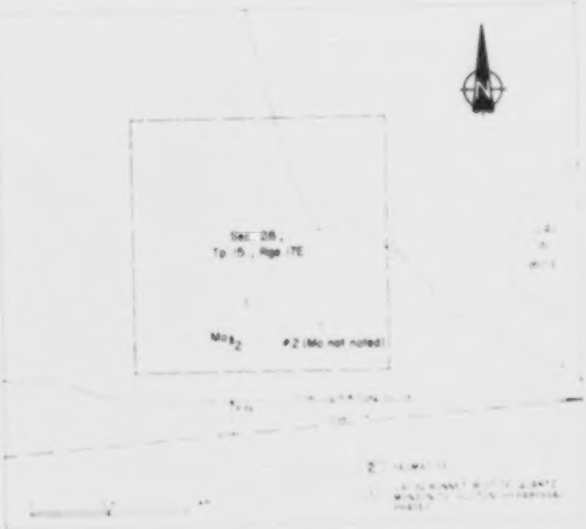


Figure 15 Location of Lac du Bois pegmatite (from airphoto A22048-228).

The trench is not likely to be visible on aerial photographs, and is difficult to spot on the ground.

K-1 pegmatite

The largest known beryl-bearing pegmatite in the Pointe du Bois area is on the K-1 claim (Fig. 16). It is a feldspar-rich pegmatite intruding grey porphyritic granite that contains disseminated sulphides. The dyke was staked in 1932 by G. Ross (see Mineral Inventory card 52L/5 Be2, in Bamburak, 1980). Some feldspar was quarried from this deposit, probably about the time of operation of the Greer Lake feldspar quarries in the mid-1930s. Unpublished reports on file with the Mineral Resources Division state that about 9 tonnes of beryl crystals was stockpiled beside the trench before 1941, but much of the beryl was removed through the years and only a small amount remained by 1957.

Both the upper and lower wall zones consist of fine- to medium-grained quartz + pink K-feldspar + albite. In the upper zone, clusters of muscovite, up to 30 cm long, are oriented generally perpendicular to the top contact. The clusters are 15 cm wide at the top, tapering to 2.5 cm at the base. In the lower zone, small red garnets occur along the quartz + K-feldspar contact. The main body of the pegmatite contains: 1) coarse grained white perthite, grading to pink and red around the edges and along fractures of crystals; 2) radiating red albite; and 3) perthite + quartz intergrowths.

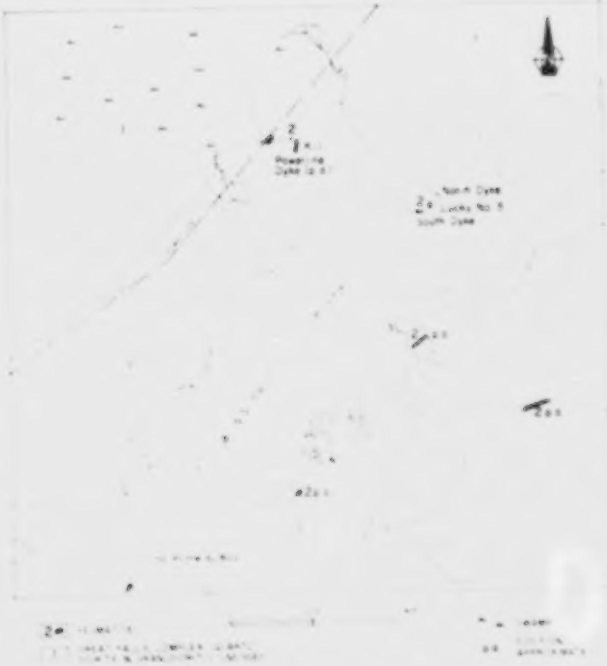


Figure 16 *Location of K-1, Lucky No. 3, and Pointe du Bois pegmatites (from airphoto A22050-9)*

A few beryl crystals were noted in places, and many were seen in surrounding rock piles. Beryl occurs predominantly as hexagonal crystals. A few beryl anhedra occur scattered through pink perthite. Types of beryl noted include glassy, faintly bluish green and yellowish green; some beryl crystals have patches of red albite intergrown along [1110] crystal planes. The two largest crystals noted were 10 x 10 cm and 7.5 x 20.3 cm, but it is probable that larger crystals have been removed.

Accessories include slightly radioactive pseudo-ixiolite in red radiating albite, arborescent fine grained tantalite-columbite in red cleavelandite, and grains of pseudo-ixiolite in beryl. Černý et al. (1981) report rare niobian rutile.

Three other parallel, westward dipping pegmatites are located in the region from 240 m west to 45 m east of the K-1 pegmatite (MRD files). At least one of these contains rare beryl (Černý et al., 1981).

Lucky No. 3 pegmatites

Two small beryl dykes outcrop along the western shore of Winnipeg River on the Lucky No. 3 claim, staked by K.M. Wengel in 1958. Both dykes intrude granodiorite of the Great Falls complex (Fig. 16).

The northern dyke strikes 185° and dips moderately to the west (Fig. 17). It is about 1.8 m wide and is exposed for 25 m north from the shoreline. The dyke has abundant quartz + pink feldspar intergrowths, pink perthite megacrysts, and clusters of both biotite and muscovite. Patches of finer grained quartz + albite + muscovite + garnet are present, containing small 0.6 cm beryl crystals; small grains of ixiolite and tantalite were identified in this finer grained phase. One beryl crystal 3 cm across was collected beside the dyke, but the overall beryl content appears to be low. Four holes were drilled in 1961, indicating the dyke dips 57° south and increases to 3 m thick on its southern extension under Winnipeg River.

The southern pegmatite is narrow, strikes 90° and dips 30° north, and is of similar composition. It has been trenched, and a few small beryl crystals are present.

Černý et al. (1981) note rare pseudo-ixiolite in both dykes.

Pine Claim, Winnipeg River

A beryl pegmatite is exposed for a length of 14 m along the south shore of Winnipeg River, 0.5 km above Lamprey Falls (Fig. 14). The pegmatite intrudes dark grey garnet-mica schist that strikes 100°, and dips vertically to 80° south. The pegmatite forms a low, shelving outcrop extending westward under the river, with a minimum width of 3.7 m. To the east, the pegmatite extends under a low cliff of the garnet schist, with which it is in irregular contact; at one point, a strike of 350° and dip of 40° east were measured. Towards the northern edge, the dip increases; to the south, the contact is covered. Immediately south of the pegmatite, a 20 cm band of massive magnetite, striking approximately east, separates the garnet schist from grey granite gneiss and biotite monzonite.

The dyke in places has a thin wall zone of striated black tourmaline and clear muscovite and quartz. Some of the tourmaline crystals are kinked. An intermediate zone consists of fine- to medium-grained pink to white albite + quartz, in places with either yellowish or greenish muscovite, or black biotite. Pale yellow to apple green beryl crystals, from 3 mm to 12 mm across, occur sparingly in this zone. A 1.2 x 0.9 m zone of massive quartz, clear to faintly rose-coloured, occurs near the centre of the outcrop; glassy green beryl crystals, up to 12 mm across, and 6.5 cm long, occur in the quartz. Wright (1932) reported that some rose quartz was noted, and that transclucent to glassy green beryl had been used as semi-precious gemstone ("gem" material).

The pegmatite was staked by F.B. Evans in 1929 as the Beryl No. 3 claim. It was restaked in 1956 as the Pine No. 1 claim by Lithium Corporation of Canada, Limited. One drill hole, collared in the pegmatite 0.6 m from the north contact, intersected 21.3 m of pegmatite. The hole had a bearing of 180° and a dip of 45°. The pegmatite consists of quartz + pink K-feldspar + muscovite, with accessory tourmaline, lithian muscovite, red garnet, and green beryl. A finer grained phase occurred from 19.1 to 21.3 m, but the lower contact was not reached.

An analysis of mica from the contact zone of this dyke is reported by Černý et al. (1981) to contain 1.89% Li_2O and 0.66% Cs_2O.

The pegmatite is one of the few known in this area to be intruded into metasedimentary garnet-mica schist. Its dimensions are not known.

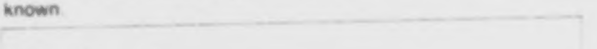


Figure 17: *Plan of drill holes, pegmatites on Lucky No. 3 claim (adapted from ESS file 91305)*

PEGMATITES OF THE GREER LAKE AREA

Greer Lake pegmatitic granite and pegmatites

A large pluton of distinctive pegmatitic granite is located between Winnipeg River and Greer Lake (Fig. 18). The pluton is characterized by bands or patches consisting of giant K-feldspar crystals, many with graphic quartz, in a matrix of albite + quartz + muscovite + garnet. A fine grained equigranular phase consists of perthite + quartz + albite + muscovite + cleavelandite. In places, pegmatite pods or dykes with beryl, cassiterite, and Li-muscovite have developed within the pluton, as described below (Clare, Annie, Rapid and Grey pegmatites). Beryl crystals may occur also at random in the pegmatitic granite, as on the northern shore of Greer Lake towards the western contact. Davies (1957, his Fig. 1) describes a variety of mica habits in this body: randomly oriented blades, multiple crosses, "sun-bursts", plumose, and "cedar-bough". In addition, some curvilamellar or "ball-bearing" type grey Li-muscovite is present in the Grey pegmatite.

The role of this pegmatitic granite in the genesis of surrounding pegmatites, including the Silverleaf pegmatite and the Greer Lake beryl pegmatites (but excluding the Huron pegmatite, q.v.), is discussed in detail by Černý et al. (1981), together with their geochemical relations.

a) Clare 1 claim

Small to large beryl crystals occur within the pegmatitic granite body on the Clare 1 claim, 380 m southwest of Garden Bay (Davies, 1957). One white beryl crystal 13 cm across and 18 cm long was observed in this vicinity.

b) Annie pegmatites

The main Annie pegmatite occurs within the pluton near its south edge. The dyke is 15 m wide and 90 m long, and consists of microcline, cleavelandite, and smoky and white glassy quartz. Scattered flakes of various forms of grey and lilac curvilamellar lithian muscovite, pale yellow muscovite, and a small number of white beryl crystals occur. According to McCartney (1930), "Considerable cassiterite is reported to have been removed from the first [largest] pit. A very few crystals are still in evidence. Apparently it was a local segregation of cassiterite. Further west there are a few more small pits. Tin values are said to be in brown and black lepidolite. A few milky white beryl crystals are noted in the showing, a few very large crystals are reported to have been

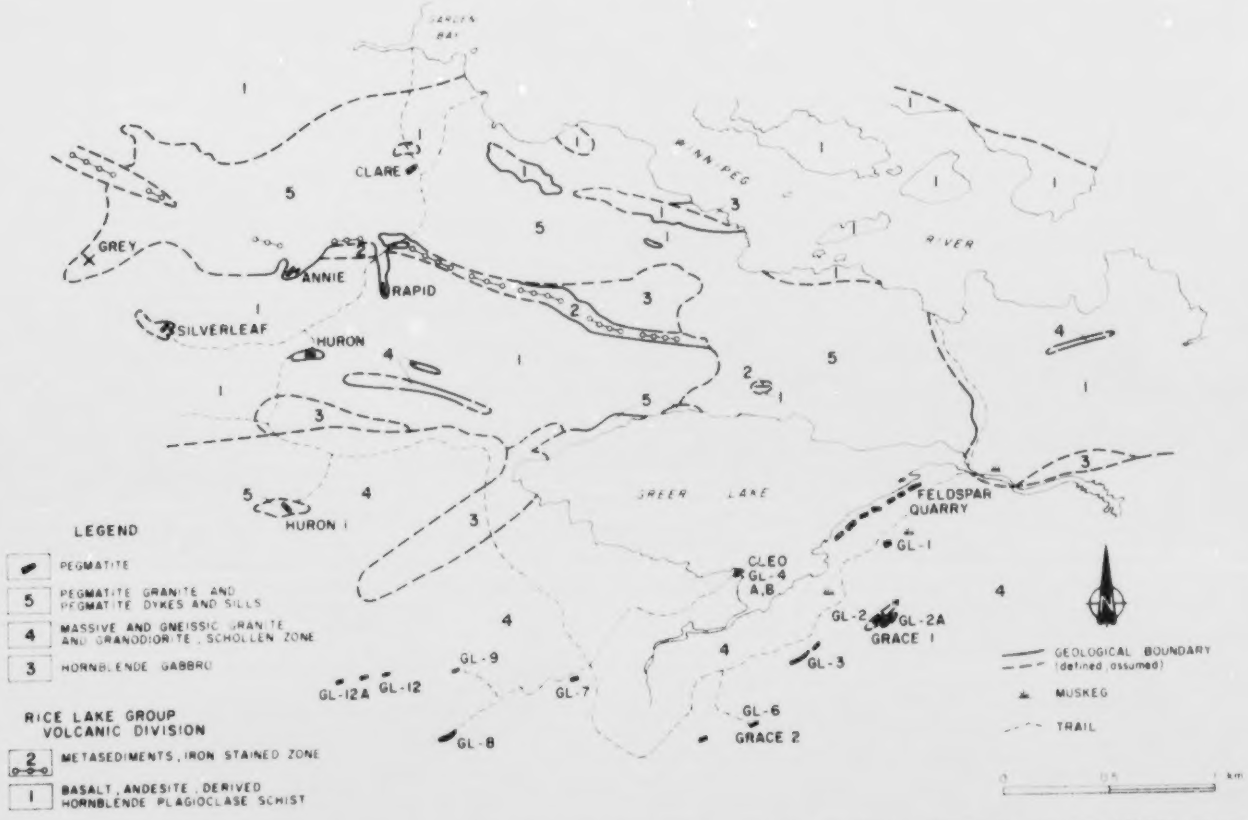

GARDEN BAY
WINNIPEG
RIVER
GREER LAKE
CLARE
GREY
ANNIE
RAPID
SILVERLEAF
HURON
HURON 1
FELDSPAR QUARRY
GL-1
CLEO
GL-4
A,B
GL-2
GL-2A
GRACE 1
GL-3
GL-6
GRACE 2
GL-9
GL-7
GL-12A
GL-12
GL-8
1
2
3
4
5
N
LEGEND
PEGMATITE
5 PEGMATITE GRANITE AND PEGMATITE DYKES AND SILLS
4 MASSIVE AND GNEISSIC GRANITE AND GRANODIORITE, SCHOLLEN ZONE
3 HORNBLENDE GABBRO
RICE LAKE GROUP
VOLCANIC DIVISION
2 METASEDIMENTS, IRON STAINED ZONE
1 BASALT, ANDESITE, DERIVED HORNBLENDE PLAGIOCLASE SCHIST
GEOLOGICAL BOUNDARY (defined, assumed)
MUSKEG
TRAIL
0
0.5
1 km

Figure 18. *Pegmatites and pegmatitic granite in the Greer Lake area. (Geology adapted from Davies, 1957; base map from A22022-183 and adjacent airphotos).*

removed." Černý et al. (1981) report three pegmatite pods on the Annie claim, all of which have rare columbite-tantalite, and which are, in part, highly enriched in Li, Rb, Cs, Be and B.

c) Grey pegmatite

Another pegmatitic pod, the Grey deposit, was reported by Wright (1932, p. 121) 403 m northwest of the Silverleaf deposit. Small amounts of grey curvilamellar lithian muscovite occur scattered through pegmatite and aplite over an area 25 by 15 m. A small amount of beryl also is present.

d) Rapid pegmatite

A curving protrusion from the Greer Lake pegmatitic granite intrudes metavolcanic rocks along the south side, 825 m southwest of Garden Bay. The off-shoot is exposed along a rock ridge, down the centre of which is a well defined pegmatite, a metre or more in width. Davies (1957) noted the occurrence of a few beryl crystals in the pegmatite.

The Clare 1, Grey, and Rapid pegmatites are of no economic value because of their small size and low amount of beryl. These pegmatites and their mineralization have been described also by DeLury (1930, p. 1017), Ellsworth (1932, p. 266), Springer (1950, p. 13), and Davies (1957, p. 19).

Silverleaf pegmatite

The complexly zoned lithium-rich Silverleaf pegmatite was the first in Manitoba (and possibly Canada) from which production of lithium minerals was achieved. It was staked as the Bear claim in 1924 by R.G.O. Johnston and F.B. Evans. It was assigned to the Silver Leaf Mining Syndicate (Canada) Ltd. in 1925 and 220 tons of spodumene and 120 tons of lepidolite were removed from an open cut in 1926 to 1928. Wright (1932, p. 114) reports "about 75 tons of lepidolite and spodumene were

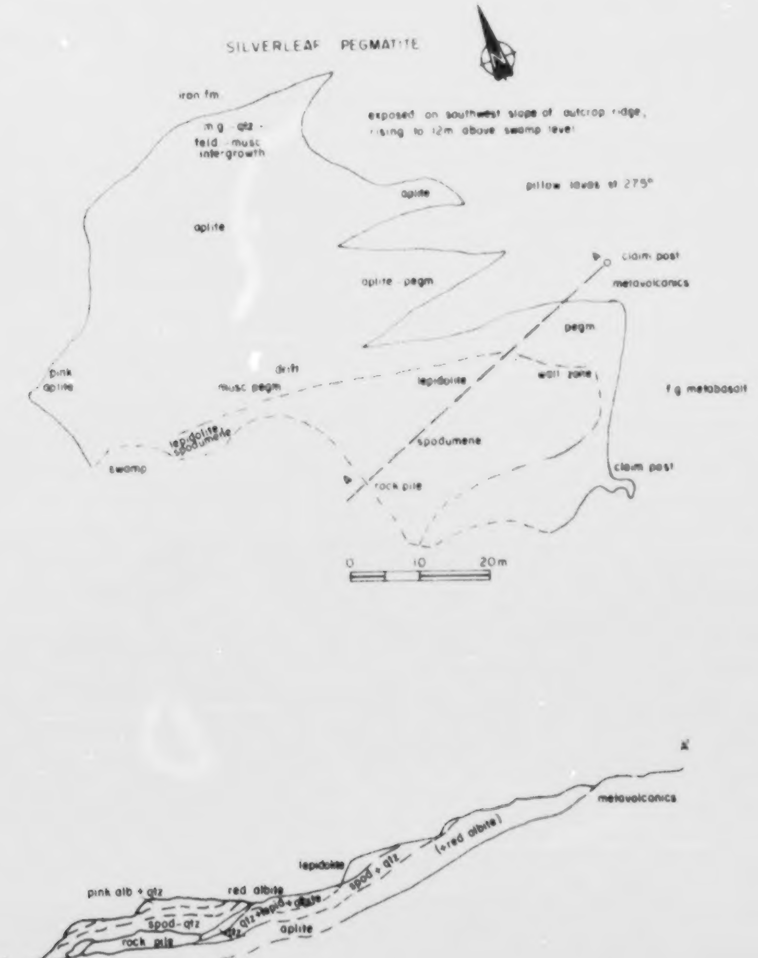

SILVERLEAF PEGMATITE
iron fm
m g qtz - feld - musc intergrowth
exposed on southwest slope of outcrop ridge, rising to 12m above swamp level
aplite
pillow lavas at 275°
aplite
claim post
aplite pegm
metavolcanics
pegm
pink aplite
drift
musc pegm
lepidolite
wall zone
f g metabasalt
lepidolite spodumene
spodumene
swamp
rock pile
claim post
0
10
20m
A'
metavolcanics
(+red albite)
lepidolite
spod + qtz
pink alb + qtz
red albite
qtz + lepid + albite
spod-qtz
qtz
aplite
rock pile
A
qtz
aplite
0
5
10m

Figure 19: *Plan and section of Silverleaf pegmatite (tape and compass survey).*

shipped to various countries ... for experimental work." Stockpiles of lepidolite and spodumene from the deposit are located at present on Garden Bay. The claim was restaked as the Bob claim in 1945, and assigned to K. Wengel in 1946. Six small pits were excavated. In 1954, the property was assigned to Lithium Corporation of Canada Ltd., and in that year 12 holes were drilled. The Bob claim is in the north-central part of sec. 17, tp. 16, rge. 16E. A poorly marked trail extends from the pegmatite for 2 km northeastward to Garden Bay on Winnipeg River.

The pegmatite is exposed mainly over an irregular area some 80 x 45 m along the southwest slope of a ridge of pillowed metavolcanics that strike 110° and dip nearly vertically. The width of the exposure is the result of the dip of the pegmatite, about 25° south, being slightly greater than the slope of the outcrop. Small exposures occur both in the swamp area at the base of the main outcrop, and also 60 m farther west in the swamp.

Most of the northern part of the main exposure consists of granitic and albitic aplite which forms the lower zone of the pegmatite. In places the aplite shows a well banded structure, accentuated by the alignment either of small quartz grains or small red garnets. The inner and upper zones of the pegmatite are exposed in an area restricted to the lower part of the slope (Fig. 19).

Along the measured section shown in Figure 19, the following zones were noted from the base upwards:

1. Contact, locally steep: strike 135°, dip 60°S. Base of pegmatite, dip decreases to southwest.
2. Border and wall zone: fine grained pegmatite: pink and white albite + quartz + mica.
3. Aplite, albitic: minor lepidolite, steel grey Li-muscovite, spodumene.
4. Pink to red cleavelandite.
5. Quartz-spodumene intergrowth + pink and white blocky microcline up to 60 cm across.
6. Mixed zone with radiating albite + deep purple lepidolite + radiating lithian mica + spodumene + curvilamellar lithia mica, radiating silver-grey and purple lepidolite in fractures in pinkish-white albite. Locally low radioactivity occurs in the radiating mica + Li-muscovite veinlets (Fig. 12) (intermixed with, or forming a matrix for, blocky microcline and quartz + spodumene of 5). Wright (1932) reports minor garnet, fluorite and calcite in this zone.
7. Gradational change to zone composed mainly of purple lepidolite, with some large masses of albite. In places, an albite + lepidolite intergrowth; minor quartz, lithian muscovite, spodumene and minor beryl. Wright (1932, p. 17) reports small amounts of topaz, montebrasite, and lithiophilite in one small area.
8. Quartz core: glassy, banded quartz.
9. Upper spodumene zone, with mica + quartz.
10. Upper red albite zone (cleavelandite).
11. Pink albite + quartz + muscovite (upper contact eroded).

Detailed descriptions of the mineralogy of the zones have been published by Stockwell (1933a,b, see also: Wright, 1932).

In the small western outcrop, a lepidolite zone 2 m wide consists of a fine grained mixture of lepidolite flakes and cleavelandite laths, and contains a few beryl crystals. Quartz + spodumene intergrowths, in a mixture of quartz + lepidolite + cleavelandite, occur on either side of the lepidolite zone (Stockwell, 1933a, p. 31). The total exposed width of pegmatite is 3 m, and the dyke dips to the south.

The pegmatite was intersected in seven of twelve holes drilled in 1954 to check the western extension of the pegmatite, and had been eroded in the other five locations drilled. Only minor lithium-bearing zones were intersected. The drilling confirmed the shallow dip of the pegmatite at about 30° south and indicated the thickness ranged from 5 to 11 m over a drilled length of 245 m (ESS file 91790).

The major rare-element minerals in the pegmatite are spodumene and lepidolite. Spodumene-quartz intergrowths are pseudomorphs of petalite (Černý et al., 1981). A variety of lithian muscovites occur in the deposit. Ellsworth (1932) reports analyses of "a dark coloured radiating mica" with 1.06% Li_2O, lepidolite with 3.39% Li_2O, and a "light lilac" muscovite with 0.13% Li_2O (see also discussion of muscovite and lepidolite in Černý et al., 1981, p. 102-105). A veinlet of radioactive minerals is reported by Springer (1950). A K-Ar date on lepidolite is reported by Lowdon (1960) as 2480 million years.

Ellsworth (1932) noted "a few small masses (of columbite-tantalite) an inch or so in diameter." Černý and Turnock (1971) report two types of pseudo-ixiolite, occurring as brick-shaped crystals and wedge-shaped rods up to 3 cm long. "The first type occurs in fractures and on intergranular surfaces of the blocky K-feldspar zone, the other is associated with lithium micas and spodumene-quartz aggregates". Chemical analyses of three samples are reported, including Nb_2O_5 of 29.9, 34.9 and 37.4 per cent, corresponding to Ta_2O_5 of 47.4, 45.4 and 42.0 per cent, respectively. Isolated black grains of cassiterite were identified, as well as rare gahnite, apatite and monazite.

The deposit is described also by McCartney (1930), Davies (1957) and Gass (1957). Other reports include DeLury (1927), Cole and Eardley-Wilmot (1926), Spence (1936), Rowe (1960), and Papish (1929).

Figure 20. *Radiating lithian muscovite, Silverleaf pegmatite; vein is 2.5 cm wide.*

Huron pegmatite

The Huron claim was staked by W.J. Davidson in 1925. The Huron pegmatite, noted for its uraninite, beryl, and tantalite, occurs in NW¼ sec. 16, tp. 15, rge. 16E, 0.8 km northwest of Greer Lake. It can be reached by trail extending 1.6 km from the southwest end of Garden Bay on Winnipeg River. The property has been held by a number of companies, including Winnipeg River Tin Mines Limited who excavated some trenches, Dalhart Beryllium Mines and Metals Corporation Limited who extracted some beryl about 1957, Canhart Mines Limited who drilled 2 holes of 61 and 77 m in 1964, and Tanlith Mines Limited. Details of ownership are listed on the Mineral Inventory Card for the Huron claim (52L/6, Be3) in Bamburak (1980).

Production from the pegmatite has been reported as some 227 kilograms of concentrated tantalite. An analysis is listed in Table 3. An unknown quantity of hand-picked beryl was produced by Winnipeg River Tin Mines about 1930. Some of the pegmatite material was processed for beryl in the Dalhart mill south of Greer Lake in 1957. About 545 tonnes of feldspar from the Huron claim were shipped to the Winnipeg Roofing Company, St. Boniface, in 1930 for use as stucco dash and for poultry grit. The dyke received international prominence following reports by DeLury and Ellsworth (1931), and Nier et al. (1941) that an age determination by the lead isotope method on uraninite and monazite crystals from the Huron pegmatite indicated an age of 2200 to 2570 million years. This latter date was cited in geological and scientific literature for many years as the oldest age determination then known.

The Huron pegmatite, an almost flat, slightly anticlinal dyke, about 3 m thick, was intruded into a subhorizontal dilational fracture in vertically dipping metabasalt. It is exposed intermittently over a length of 120 m (Fig. 21). The area shown has been extensively trenched. Northwest of the trenched area, the pegmatite grades into an irregular aplite + pegmatite mixture that is exposed over an area 30 m wide on the southern slope of a ridge of metabasalt.

The western part of the pegmatite is exposed along the base of a 1 to 4.5 m cliff of metavolcanic rocks. The top contact dips irregularly about 15° south (Fig. 22) and is generally flat, except where it increases to 40° south at the western end of the outcrop. The dyke plunges 10° east at the eastern end of the exposure. The dyke is composed predominantly of pink and white albite and perthite, with reddish iron oxide along fractures. The dyke has a fine grained border zone at the top. In the pit at the east end of this exposure, the full width of 2.5 m is exposed. The lower chilled contact zone (Fig. 23) underlies a fine grained pegmatite zone. A quartz zone is present on the eastern and southern faces of the pit. A concentration of small green beryl crystals, from 5 to 10 cm long and 12 mm in diameter were reported by McCartney (1930) along with masses of beryl over 25 cm across. The beryl zone was originally reported over an area 6 by 2.5 m.

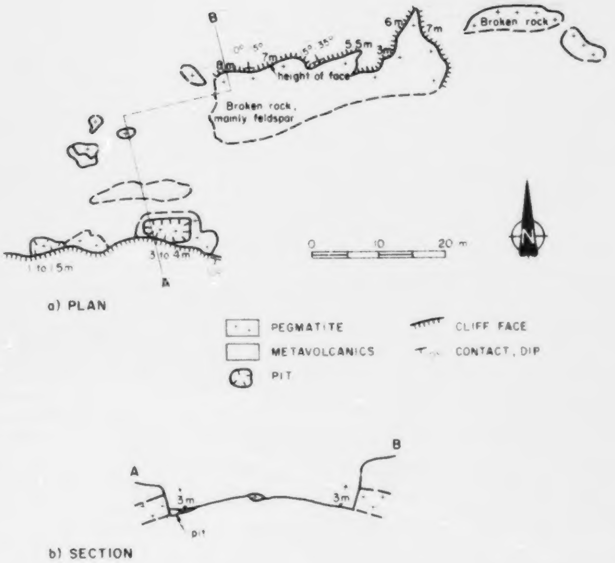


Figure 21: *Diagrammatic plan and section, main exposure of Huron pegmatite.*

To the north of this cliff, the pegmatite has been eroded, and a low ridge of metabasalt below the dyke is exposed on the floor of a natural trench. One small outcrop exposes the lower contact of the pegmatite

Figure 22: *Huron pegmatite, upper contact.*

The pegmatite is exposed over a length of 40 m along the cliff on the northern side of the central trench. Dips measured on the top contact range from 10° to 15° north, with a steep roll near the midpoint of the outcrop where the dip increases to 35°. The strike of the dyke is 110°. A large pile of broken rock obscures much of this exposure, especially at the western end. There an abundance of perthitic microcline is present in the rock pile.

Farther east along the north wall of the central trench, abundant "tantalite-columbite" occurs in pinkish white, albite, both as elongated blades up to 7 cm x 3 mm and also as triangular patches; specks of red iron oxide are associated with the tantalite-columbite. Three analyses of columbite, tantalite, and pseudo-ixiolite from the Huron dyke are listed in Table 3.

At the eastern end of the central trench, the top contact of the pegmatite is horizontal and has a slight easterly plunge. A zone of blocky pink to white albite (25 x 13 cm) with clusters of muscovite is underlain by a massive quartz zone 2 m long and 0.6 m thick. Red albite + biotite + muscovite occur along a subhorizontal fracture below the quartz. Yellowish-green beryl crystals to 2.5 cm across are present in the nearby rock pile. Originally, large pale green beryl crystals were reported associated with the quartz lens and the "tantalite-columbite" over an area of 3 x 12 m (Davies, 1957; McCartney, 1930). Also, a large mass of a "golden beryl" was reported in company reports and referred to as "chrysoberyl" with a BeO content of 17.2% (MRD files), but much of the beryllium mineralization has been removed from this dyke, probably by Dalhart Beryllium. Davies (1957) reported also euxenite-polycrase crystals, black vitreous quartz, dark grey and honey-coloured zoisite (clinozoisite according to Černý and Bristol, 1972), from that part of the dyke, as well as uraninite and monazite. Some radioactive material containing uraninite was collected there in 1955 by the writer and by Davies, but none could be located in the 1970s. Most of the original uraninite appears to have been removed. Černý and Turnock (1971) identified lath-shaped crystals as pseudo-ixiolite frequently replaced by fersmite, and reported the occurrence of thorite and pyrochlore-microlite. An analysis of the pseudo-ixiolite is listed in Table 3. Fersmite is a complex Ca, Al, Mg, rare earth member of the columbite group, and forms pseudomorphs after pseudo-ixiolite in the Huron dyke; it is black to brown, and semi-translucent. Rare niobian rutile, microlite, and topaz are reported by Černý et al. (1981).

An extension of the pegmatite is exposed farther east in a long trench along the north wall of the dyke, and in a cross-trench at the eastern limit of exposure. The rock pile consists mainly of feldspathic material. McCartney (1930) reported some pitchblende and tantalite along the northern edge of this extension.

The Huron dyke is the topic of a thesis by Paul (in prep.). Genetic relationships are discussed by Černý et al.(1981). The Huron dyke is considered on geochemical evidence to be part of their Shatford Lake pegmatite group, and is not considered to be derived from the adjacent Greer Lake pegmatitic granite.

Greer Lake area: development and production

A pegmatite swarm south of Greer Lake contains occurrences of beryl, lepidolite, columbite-tantalite and other mineralization in an area 5 km (E-W) and 1.6 km wide (N-S). The pegmatite dykes cut metasedimentary rocks (quartzite, biotite and hornblende schists, and greywacke) and metavolcanic rocks (andesite to basalt, massive to schistose, porphyritic and pillowed in part), all included in the 'schollen zone' of Janes (1976). The large pluton of white pegmatitic albite granite, a well defined unit north and northwest of Greer Lake, has been described above. Grey to pink granodiorite, in places showing gneissosity, occurs throughout the defined area, cutting the Rice Lake Group rocks. The northern part of the Greer Lake area was mapped by Davies (1957); the entire area was mapped by Janes (1978b).

Pegmatite dykes on the Greer Point mining claim were quarried from 1933 to 1935 as a source of feldspar, mainly microcline. Interest in lithium deposits in the area in 1956 resulted in the mapping of the Loon claims, held by M. Smerchanski. A swarm of pegmatites was

Table 3. Ta-Nb minerals, Huron pegmatite

	(1)	(2)	(3)
Ta_2O_5	71.01	26.41	37.3
Nb_2O_5	4.60	52.22	42.5
Fe_2O_3	14.32	—	—
FeO	—	14.77	16.4
MnO	2.25	2.17	4.5
CaO	2.00	2.66	n.d.
Al_2O_3	1.67	—	n.d.
SiO_2	1.40	0.13	n.d.
MgO	1.32	0.45	—
NO_3	0.69	—	—
TiO_2	0.24	0.49	0.18
ZrO_2	—	0.65	—
SnO_2	—	—	0.0
H_2O	0.80	—	—
LOI	0.80	—	—
Total	100.30	100.20	100.28

(1) Tantalite, 20 pound sample (9 kg); analysis by Department of Mines, Ottawa, about 1930 (Bamburak, 1980).
(2) Columbite, Huron claim (Ellsworth, 1932, p. 270).
(3) Pseudo-ixiolite, lath-shaped crystals in albite (Černý and Turnock, 1971).
Note: n.d.: not detected; -: not reported.

Figure 23: Huron pegmatite, lower contact along dashed line.

Figure 24: Dalhart Minerals Corporation: old mill for beryl, on ridge south of Greer Lake.

located in the area mainly south of Greer Lake, and the abundance of beryl led to development work in 1956 and 1957 by Dalhart Minerals Corp. Ltd. (in 1957, renamed Dalhart Beryllium Mines and Metals Corporation Ltd.) under the direction of G.A. Russell. Černý and Turnock (1971) quoted a report that of 150 pegmatites in the Dalhart area, 49 contained some beryl. About 15 of these were trenched and two types of beryl mineralization were noted: 1) scattered concentrations of large beryl crystals amenable to hand-cobbing, and located either in core zones or locally in intermediate zones marginal to the core, and 2) finer grained beryl crystals and minor anhedral beryl disseminated through the dykes.

Beryl is found mainly as prismatic yellowish or greenish crystals associated with intermediate zones (albite + quartz + muscovite) in the Greer Lake pegmatites; some yellowish, bluish or colourless beryl is found either in blocky K-feldspar + quartz or along the margin of adjacent quartz cores (Černý and Turnock, 1975).

A crushing plant and mill were built on the northeastern part of the Grace claim (Fig. 24). By August 1957, 18 tonnes of hand-cobbed beryl crystals had been stockpiled, and a few thousand tonnes of pegmatite containing disseminated beryl had been milled. It was planned to extract beryllium from this material by a chemical process developed by Drs. G. Biermann and H. Gesser at the University of Manitoba. However, commercial production was never achieved.

The Grace claim was staked by Grace Casey in 1925; the Grace 1 and 2 claims were staked by Roy Pickard in 1932.

Greer Lake feldspar quarry

A large concordant, giant-textured feldspathic pegmatite, close to the southeast shore of Greer Lake, was quarried for feldspar from 1933 to 1935. Several thousand tonnes of K-feldspar were quarried by Feldspar Products Limited and shipped to Warroad, Minnesota, for use in ceramics.

The pegmatite is a vertical dyke, striking 70°, and is intruded concordantly into grey granite gneiss. The main pit at the eastern end is 60 m long, 6 to 7.5 m wide, and about 7.5 m deep; at one point near the eastern end, the pit face is 11.5 m high, the lower 4 m being under water in 1972 (Fig. 25). At the southeastern end, masses of aplite, abundant quartz + pink K-feldspar intergrowths, and some white albite + quartz intergrowths are present. The south wall of the quarry shows spectacular masses of pink microcline, with crystals a few metres across; one crystal on the north wall was estimated to be 2.1 m long and 1.2 m wide. Large masses of quartz occur with the feldspar, and also masses of muscovite up to 3 m long and 0.3 m across. Shepherd (MRD files) noted that large replacement masses of cleavelandite occurred next to a central zone 4 m wide of coarse microcline, and that only portions of the centre of the dyke contained a grade of potassium feldspar suitable for ceramics.

Springer (1950, p. 14) reported "a few reddish-brown crystals of a complex mineral" in the feldspar quarry. Also, a small amount of bismuthinite occurs associated with muscovite.

Another large pit, some 15 x 6 x 2.1 m is present southwest of the main pit. At its western end, it is predominantly a white feldspathic pegmatite. Pegmatite outcrops intermittently over a length of 0.5 km along or near the southeast shore of Greer Lake.

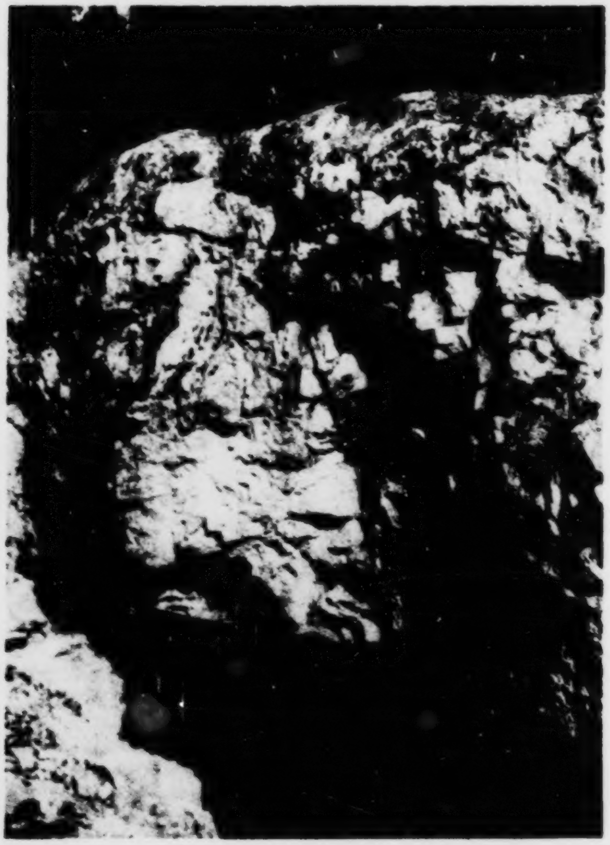


Figure 25: Feldspar quarry, eastern end; height of cliff above water level is 7.5 m.

Pegmatite southwest of feldspar quarry (GL-1)*

A pegmatite is exposed in two outcrops 12 m apart, 293 m southwest of the feldspar quarry. The wall rocks are not exposed. A pit 6 x 3 m, and 2.4 m deep has been blasted into the western outcrop, and the south face of the eastern outcrop has been blasted.

The presence of a possible quartz core suggests a crude zoning. A feature of the dyke is the abundance of graphic K-feldspar + quartz, and K-feldspar crystals containing 3 to 6 mm lenses and stringers of quartz. Muscovite, biotite, smoky quartz, and red garnet to 6 mm in diameter are present. Only a small amount of beryl was noted; a 5 cm crystal of greenish beryl is associated with muscovite.

Grace 1 claim (GL-2, GL-2A)

The largest of the pegmatites exposed south of Greer Lake is a zoned dyke, containing beryl and minor Nb-Ta mineralization, on the Grace 1 claim. The main dyke was mapped over a length of 115 m. Two small pits expose a separate pegmatite 9 to 15 m southeast of the main dyke. Another small pit has been blasted into an apophysis of the main dyke, but the major excavations are:

1) West trench: 27 m long, 12 m wide at base, sloping outwards on both sides to up to 30 m width at top; 5 m deep on south side, 7.5 m on north side; probably an old trench blasted for feldspar.
2) Northeast trench: down slope of ridge: 22 m long, 7.5 m wide, variable in depth, in steps down slope, this joins an older pit at the base of the ridge. Main part excavated by Dalhart in 1956-1957.

The wall rock consists of pink to grey granitic gneiss and oligoclase granite to the north, and predominantly granitic gneiss to the south. The gneissosity strikes 55°, dips 75°N. In the west central part of the exposure, partially granitized mica schist and migmatite are present in contact with the dyke, and the dyke contains inclusions of both mica schist and granite gneiss. The main dyke, at the west end, is almost concordant, striking 55° and dipping 65° north on the south side. Towards the east, the dyke transects the gneissosity at a low angle, and at the east end of the exposure, a general strike of 40°, dip 85° northwest was noted. The contacts, particularly on the south side, are irregular.

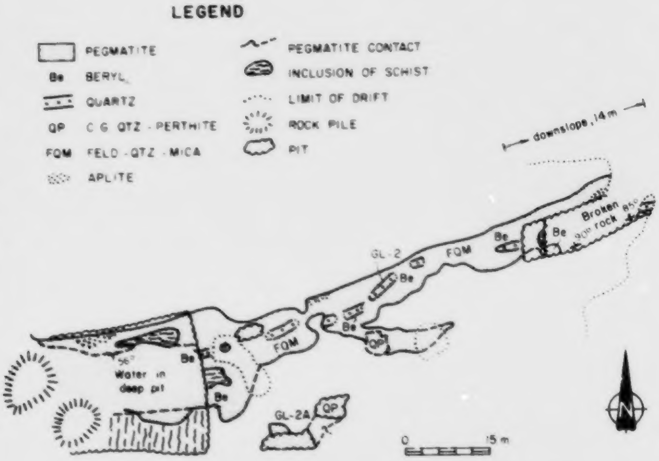
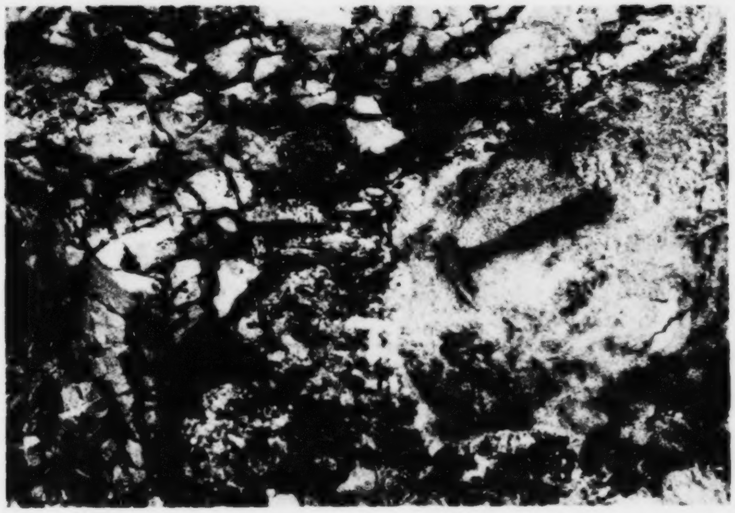


Figure 26: Sketch map of Grace 1 pegmatite (GL-2 and GL-2A).

---

* Numbers in brackets correspond to those used by Černý and Turnock (1971, their Fig. 1) and subsequent reports. See Figure 18, this report. Detailed geological maps of the Greer Lake pegmatite area have recently been released: see ESS file 92363.

Figure 27: *Grace 1 pegmatite, northeastern pit, showing lobate penetration front of saccharoidal albite unit; note concentric banding.*



Two pits to the south of the main dyke expose roughly parallel, but distinctly separate, pegmatites (GL-2A). The dykes are 3 to 3.6 m wide, and the pits are 9 m and 6 m long. The dykes are in irregular contact with the granitic gneiss and mica schist inclusions; in one place a strike of 60° and dip of 60° to 55° NW was measured. These dykes consist mainly of very coarse grained pink microcline-perthite with masses of coarse quartz. A granitic border zone occurs on the south side. The southern dyke ends abruptly to the east, being overlain by grey granodiorite with metavolcanic inclusions. Although the contacts are irregular, the dyke can be seen to definitely transect the gneissosity. Only a small amount of beryl was noted in places; some large crystals are present in hand-cobbed pieces beside the south pit.

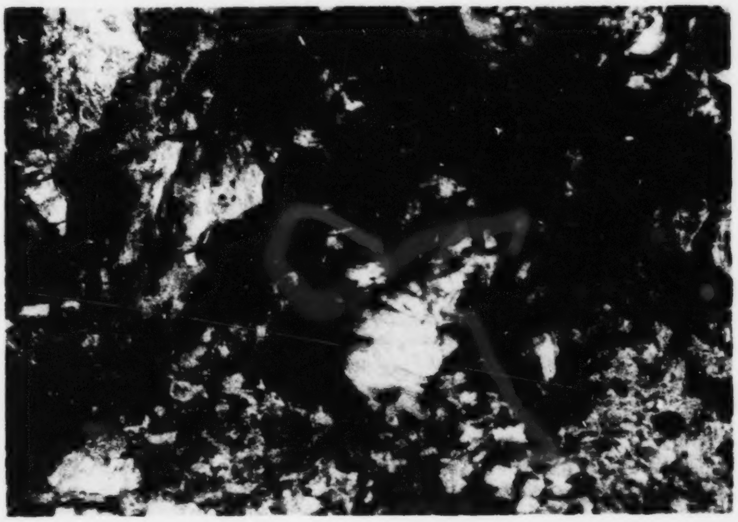
The major features of the Grace 1 pegmatite (GL-2) are shown in Figure 26. Aplite occurs in several places as a replacement unit along the north contact (Fig. 27). The aplite consists predominantly of albite. In the easternmost exposure, coarse black biotite is scattered through the aplite over a width of 4.25 m; some pink K-feldspar crystals are present.

The major part of the dyke consists of a medium- to coarse-grained K-feldspar + quartz + mica zone. This zone has been removed in the western pit. Stockpiles contain pink feldspar, mainly microcline, and beryl crystals (both in feldspar and as individual crystals associated with muscovite). Inclusions of gneissic granite + mica schist have telescoped wall zones surrounding them. In the eastern pit, a zone 2.4 m long, 1.8 m high, and 1.8 m wide near the southern contact consists of coarse, bluish quartz, large books of muscovite (up to 30 x 30 x 20 cm), and scattered large beryl crystals (up to 30 cm across); the zone is moderately radioactive (Fig. 28).

Černý and Turnock (1971) reported the presence of pseudo-ixiolite, microlite, and Nb-rutile from this pegmatite, occurring in late cleavelandite. In the GL-2A pegmatite, pseudo-ixiolite and microlite occur as a "large bunch of radiating fibres in cleavelandite", and are "partly metamict" (op. cit.).

The largest beryl crystals are associated with a core zone of massive quartz. However, the zone is not continuous in outcrop (see Fig. 26), nor are beryl crystals always associated with the quartz pods.

Figure 28: *Grace 1 pegmatite, northeastern pit, beryl + quartz + mica zone. Hammer is 33 cm long.*



Beryl dyke, Grace 2 claim (GL-6)

A beryl pegmatite on the Grace 2 claim has been trenched over a length of 45 m. The narrow dyke parallels the gneissosity of the surrounding migmatitic gneiss, both striking 82°; however, the planes of gneissosity dip 60°N, whereas the dyke at the east end of the trench is vertical, and, on the south contact near the west end, dips 60°S. At the extreme western end of the exposure, the pegmatite is almost flat-lying.

The pegmatite consists predominantly of coarse quartz and pink albite and is characterized by 0.6 to 1 cm euhedral beryl crystals of an apple green shade. Some of the beryl is glassy and pale green, and one small aquamarine crystal was noted in quartz. In rock piles beside the trench, beryl crystals up to 5 cm across were noted, but they are mostly between 0.6 and 2 cm across. Davies (1957, p. 19) noted a "spectacular concentration of beryl crystals on the face of the trench over a few square feet. Crystals of green beryl, some of pleasing tints, form up to 30 per cent of the face".

At the east end the dyke is 60 cm wide; 10 m farther west it is 1.8 m wide, and contains some inclusions of grey granite gneiss. It has an aplitic border zone up to 2 cm wide, containing red garnets. Pyrite and coarse grained black mica are present in the wall zone. The central zone, forming most of the dyke, is coarse grained quartz + microcline; a study of thin sections indicates that abundant fine grained interstitial albite is present. The beryl crystals observed are either concentrated along the quartz + feldspar contacts or, more rarely, completely enclosed in either mineral.

Some "columbite-tantalite" crystals are associated with the beryl.

Davies (1967) reported the dyke has been traced for 90 m and also that minor tourmaline is present. This dyke has been known as the "Jewel vein" (Springer, 1949) and as the "Gem vein", but the implied hopes for true gem beryl have not been realized. Černý and Turnock (1971) reported the occurrence of a granular intergrowth of pseudo-ixiolite and microlite in the feldspar.

Top-of-the-World pegmatite

On the rock ridge in the southeastern part of the former Loon 10 claim, two parallel pegmatites outcrop to the west of a large pegmatite that can be traced intermittently over a length of 610 m to the southwest. The most westerly of the dykes is zoned and is exposed in a small pit at the top of the cliff. Pink pegmatite cuts pink granite, and is 6 m wide, strikes due north, and dips 80° to vertical. From east to west the dyke consists of:

0.3 m border zone	fine grained quartz + pink feldspar
1.2 m wall zone	pink albite + quartz
0.6 m intermediate zone	quartz + pink albite + lilac lithium mica in patches that form up to 30% of the zone over a small area
0.6 m core zone	quartz, glassy, in places with translucent parallel bands, perpendicular to the contact
0.6 m intermediate zone	quartz + pink cleavelandite + muscovite
0.1 m border zone	fine grained quartz and feldspar, graphic intergrowth in part

This dyke is believed to be the "Top-of-the-World" pegmatite (Wright, 1932). Another pegmatite outcrops 60 m to the northeast, where other beryl-bearing pegmatites have been reported, e.g., on the former Captain group of claims, but contradictory reports on the amount of beryl present could not be resolved definitely in the present survey. Although some pale green albite was noted, beryl crystals were not observed.

Pegmatite south of Greer Lake (GL-3)

A pegmatite dyke, up to 8 m wide and 60 m long, outcrops on a ridge of grey granite gneiss to the south of the wide trail southwest of the mill site. The dyke strikes 70° and dips steeply north. The dyke is exposed in a trench 8 x 2.4 m and 1.2 to 1.5 m deep near its western end and in a small pit 23 m to the east.

In the western trench, the pegmatite is mainly fine- to medium-grained, feldspathic, low in quartz, and contains some mica and small red garnets. Some coarse grained pink feldspar has red to orange staining. In the eastern pit, pegmatite has been blasted from the face of a cliff. Pink medium grained albitic pegmatite with some quartz is exposed. Golden beryl is associated with muscovite. Some streaky intergrowths of quartz and K-feldspar are present, along with garnet crystals to 9 x 12 mm. Numerous small garnets occur in an aplitic phase.

Towards the eastern half of the pegmatite some coarse grained quartz lenses and feldspar patches suggest a discontinuous quartz core zone roughly along the centre of the dyke. Some green beryl is present in the quartz core. Černý et al. (1981) report rare (?)pseudo-ixiolite and microlite from this pegmatite.

Pegmatites southwest of Greer Lake

Several beryl pegmatites, at least two of which contain some lithium mica, outcrop in the area southwest of Greer Lake (Fig. 18). The area is one of complex geology, being underlain by metavolcanics, metasediments, migmatite and pegmatitic granite. Seven pegmatites opened by trenching by Dalhart Beryllium Mines and Metals Corporation about 1957, are described.

Pegmatite GL-7

A pegmatite dyke intruding granite is exposed in a trench 15 m long and 2.7 to 5 m wide, at the base of a low ridge. The dyke strikes 112°, but dip was not determined. A chilled contact was not noted. The dyke consists mainly of typical medium- to coarse-grained pegmatite, with abundant coarse pink perthite. Some K-feldspar + quartz intergrowths and minor aplite are present. Yellowish-green beryl crystals from 3 to 18 mm across occur in the coarse grained core zone. Books of muscovite and black biotite blades, some in radiating clusters, are present.

Pegmatite GL-9

The pegmatite is located 1600 m at 263° from the mouth of the creek entering the south bay of Greer Lake. The beryl-bearing dyke can be traced over a length of 96 m, and a trench 19 m long has been blasted near its western end.

Relationships with the country rock are complex. West of the trench a dark grey granitic gneiss contains an inclusion of a diabase-textured rock and some metavolcanic xenoliths. A pink granite porphyry containing abundant xenoliths is in irregular contact with the pegmatite; patches of pink aplite are abundant in the pink granite porphyry.

The pegmatite at the western end appears to have low dips of about 15° to 20° to both the north and to the south (Fig. 29). Contacts appear irregular, and patches of pegmatitic material occur as numerous masses and stringers in the wall rocks. The pegmatite exhibits a zoned structure in the trench. A wall zone consists of fine- to medium-grained white albite + pink microcline + quartz + mica. The mica is in black, diversely oriented aggregates that, where seen edgewise, appear as needle-like masses more than 5 cm long. This association forms a distinctive rock type noted also in pegmatite GL-12A. Near the eastern end of the pit, muscovite books up to 10 cm across occur in the wall zone. The only beryl observed in place occurs in this zone as translucent pale greenish to yellowish pale green interstitial anhedra. The inner part of the wall zone consists of coarse blocks of pink microcline and albite-quartz intergrowths with interstitial quartz.

A discontinuous quartz-rich core outcrops sporadically along the centre line of the trench. In places, large books of muscovite occur in clusters around the quartz.

A few crystals of green beryl, well crystallized and up to 25 mm across and 25 mm long, were found among the rock piles beside the trench. Černý and Turnock (1971) reported the occurrence of pseudo-ixiolite and niobian rutile. The pseudo-ixiolite occurs as radiating fibrous

Figure 29 *GL-9 pegmatite, western end, showing shallow dips of sheeting*

crystals in cleavelandite. Rare cassiterite and gahnite are present (Černý et al., 1981) along with a "disordered titanian columbite" that contained 38.0% Ta O , 37.1 Nb O , 8.8% TiO and 3.3% SnO .

Pegmatite GL-12

A pegmatite containing beryl and lithian muscovite occurs 335 m at 265° from pegmatite GL-7. It outcrops along the northern edge of a ridge of grey granite gneiss. A ridge of metavolcanics occurs 9 m farther south. At the eastern end, the pegmatite strikes 80° and dips 80° south. The planes of gneissosity dip 55° north and a shallow trench 13.5 m long has been blasted along the pegmatite.

The pegmatite, bordered by a pink aplite phase, consists of albite + quartz + muscovite, and contains a core of massive quartz up to 60 cm wide. Microcline megacrysts are associated with the quartz core. Beryl occurs both as euhedral crystals and interstitial masses associated mainly with the pink microcline, but also with the albite + quartz + muscovite phases.

A notable feature of this pegmatite is the presence of green lithian muscovite at the western end of the trench. It occurs as masses, up to 10 cm across, along a fracture that strikes 80° and dips 75° north, extending out from the quartz core. Purplish curvilamellar lithian muscovite was noted in rock piles beside the trench, and other purplish mica is similar in appearance in hand specimens to the lepidolite from the Silverleaf pegmatite. In thin section, this mica occurs both as coarse blades with abundant inclusions, and also as an intergrowth with sodic plagioclase.

Černý and Turnock (1971) report the occurrence of pseudo-ixiolite (fine lath-shaped radiating crystals in albite and quartz) with microlite and tantalian rutile (Ta, Nb) in the dyke. Rare gahnite, apatite and monazite are reported by Černý et al. (1981).

Pegmatite GL-12A

Pegmatite GL-12A occurs 92 m slightly north of west from pegmatite GL-12. The pegmatite contains beryl and green lithian muscovite and is exposed in a trench 11 by 1.5 m, and 60 cm deep. The pegmatite has a white albite + pink K-feldspar + quartz + black mica assemblage, with the mica in 'needles' or flakes, similar to that seen in the wall zone of pegmatite GL-9.

The pegmatite, occurring *en echelon* with GL-12, cuts pink granite and strikes 90°. It can be traced 91 m west from the trench, and is exposed in a pit, 1.5 x 1.5 x 0.9 m, 69 m west of the trench. It is 3.7 m wide at the east end, and narrows westward, where it contains much aplite. The pegmatite appears to be vertical, except in part of the south wall of the large trench, where the dip is variable between 80°S and 25°S.

In the main trench, red garnets occur in the medium grained wall zone. Near the north wall, a concentration of 10 small greenish beryl crystals and anhedra occur in white cleavelandite + quartz + muscovite that encloses blocky pink K-feldspar. Coarse pink K-feldspar + quartz intergrowths occur in the central part of the dyke. A small 7.5 x 5 cm patch of green lithian muscovite was noted in the bottom of the trench, near the centre.

Černý and Turnock (1971) reported the occurrence of pseudo-ixiolite as fine lath-shaped radiating crystals in albite and quartz. Cassiterite was identified, by X-ray diffraction, as occurring mixed with the pseudo-ixiolite. Some columbite-tantalite also is present (Černý et al., 1981), and "disordered manganotantalite" with 84.0% Ta O , 1.3% Nb O and 1.3% MnO.

Pegmatite GL-8

A pegmatite containing beryl outcrops along the top of a high granitic ridge, 600 m at 185° from pegmatite GL-9. The dyke strikes approximately 90°. It is exposed in two trenches along the top of the ridge and in a pit down the eastern slope of the ridge. The dyke may be a pegmatitic phase of a mass of pegmatitic granite that contains inclusions of fine grained metagreywacke.

The pit on the eastern slope exposes mainly a coarse grained granite, in places pegmatitic. Perthite-quartz intergrowths occur, and a beryl crystal 15 cm long was noted associated with coarse quartz. A zone of banded aplite with small red garnets is present on the north side. A small stockpile of pale green beryl crystals is present beside the pit, and more were noted in place in a medium grained pink to white albite-quartz phase. At the western end of the pit, a greywacke inclusion is traversed by pegmatite stringers.

The coarse pink microcline-perthite + quartz + albite pegmatite exposed in the most westerly trench contains clots of a biotite + garnet + muscovite assemblage, with which green beryl up to 4 cm across is associated. A narrow persistent pegmatite stringer is present in metasediments about 10 to 15 m north of the trenches.

The gradational relations of the pegmatite with enclosing granite, the presence of banded aplite, and the variation in grain size all suggest that this area may be an outlier of the pegmatitic granite pluton north of Greer Lake.

Černý and Turnock (1971) reported pseudo-ixiolite and microlite in granular intergrowths, and dark steel grey irregular grains of niobian rutile containing exsolution lamellae of columbite. Their X-ray work indicated the presence of both cassiterite and ilmenite in small amounts in GL-8. Cerny et al. (1981) noted coarse aggregates of altered cordierite from near this pegmatite, and in several other dykes nearby (GL-1, 4A, 4B, 9, 11 and 12). The biotite + garnet + muscovite assemblage noted above is one such aggregate.

Cleo pegmatite (GL-4A and 4B)

The Cleo pegmatite, near the midpoint of the south shore of Greer Lake, is well exposed in a trench (GL-4A) along the southwest side of a ridge of biotite granite gneiss, and also immediately to the south in a low rounded outcrop (GL-4B) from which overburden has been removed.

In the area of the GL-4A trench, a 3 m face of pegmatite consists of fine- to medium-grained red and white albite + quartz + muscovite + garnet. Abundant muscovite in masses up to 10 cm across is present, and one mass with a triangular cross-section consists of muscovite layers at 3 mm intervals, separated by muscovite with comb structure. The dyke cuts the regional gneissosity at 25°, and is 5.5 to 7.6 m wide at its eastern end, where it encloses patches of granitic gneiss. Abundant iron-staining and minor pyrite are present. The beryl content of the pegmatite is low. A mica sample from this outcrop showed 0.72% Rb_2O, 0.49% Li_2O, and 100 ppm Ga (ESS file 92198).

In outcrop GL-4B, the pegmatite is coarse grained. Beryl occurs both as coarse glassy green crystals (5 x 12.5 cm) between coarse quartz and fine grained pink albite + quartz + yellow mica pegmatite. Some smaller beryl crystals were noted. Quartz is clear to smoky.

Another outcrop of pegmatite, 30 x 4.5 m, is located 90 m to the southwest. It is somewhat similar to GL-4B, and has coarse albite and some K-feldspar patches. Beryl was not observed; the outcrop has not been trenched.

Černý and Turnock (1971) report the occurrence of pseudo-ixiolite in the medium grained albite + quartz + muscovite + garnet assemblage; it is in part replaced by microlite. A few crystals of partially disordered columbite were identified by X-ray diffraction methods.

Huron 1 pegmatite (GL-11)

Pegmatites on the Huron 1 claim outcrop 1220 m slightly south of west from the west end of Greer Lake along a large isolated outcrop area surrounded by bush and muskeg. The main dyke strikes 110° and at its north end is in vertical contact with grey granite gneiss. A trench 0.6 to 1.5 m deep, and about 46 m long, has been blasted across the outcrop ridge. It cuts across the pegmatite at a low angle to the strike. Other trenches and pits are present farther east.

A description of the pegmatite as exposed in the trench, from northwest to southeast, is:

1. Pink zone, 4.6 m, fine- to medium-grained pegmatite consisting of pink albite, quartz, and mica, both muscovite and a black to silvery grey biotite; red garnets 6 to 25 mm across and yellowish-green anhedral beryl are present.

2. A gradational zone from 4.6 to 6 m contains both pink and white albite, coarse radiating black mica, and some garnet.

3. The central zone has medium grained white albite, with quartz and mica. Some iron-stained patches are associated with pyrite that occurs as fine grained crystals or clusters of crystals up to 12 mm across. Some of the feldspar contains streaks of red iron oxide.

4. The southern 9.1 m of the dyke is a pink zone similar to that along the north contact. A patch of glassy green beryl crystals, 7.6 x 10 x 7.6 cm, occurs in the central part of this zone.

To the south the dyke is in irregular contact with a fine grained grey alaskite that may be an outlier of the pegmatitic granite pluton north of Greer Lake.

PEGMATITE DYKES AT THE NORTH END OF EAGLENEST LAKE

On a small island south of Pine Island (Fig. 14) a pegmatite dyke striking 45°, dipping steeply south, cuts grey porphyritic granite; narrow apophyses from the pegmatite also cut the granite. The dyke is 1.2 m wide for most of its length, but widens in places to 1.8 m. It consists mainly of pink perthite, lesser finer grained albite, and quartz. It is characterized by numerous small glassy apple-green beryl crystals.

On the island to the east, some dykes cut the granite, and some displace earlier grey aplite dykes. Small crystals of glassy bluish-green and aquamarine beryl have been collected from pegmatites outcropping on the islands in this area.

Springer (1950, p. 11) noted beryl crystals in pegmatite dykes along the eastern shore of Winnipeg River, to the northeast of the above occurrences. One of the beryl-bearing dykes is near the south boundary of the former Luke group of claims; it cuts a grey porphyritic granodiorite, gneissic in part (Fig. 14). The dyke strikes 85° and is nearly vertical. Some trenching was done many years ago. A number of small milky green beryl crystals occur in the coarse grained pink pegmatite. (See Mineral Inventory card 52L/6 Be5, in Bamburak, 1980).

PEGMATITES OF THE SHATFORD LAKE AREA

Numerous pegmatites are present west, south, and east of Shatford Lake. Initial interest in the pegmatites was the result of the discovery in 1924, by K.E. Miller, of cassiterite on a small reef-like island near the southeast corner of the lake. Later work on the Shatford Lake pegmatites revealed the occurrence of reasonable amounts of beryl, as well as some tantalum and lithium minerals. Monazite and gadolinite also have been reported. Regional geology is shown in Figure 30.

Cassiterite dyke, Tin Island

The original discovery was made on a 12 x 18 m island, where an exposure of pegmatite less than 3.6 m wide occurs along the contact between garnet-bearing metasediments to the north and metavolcanics to the south. The dyke dips north at a steep angle; the garnet bed dips north at 45°. Some bluish beryl crystals are present in a rock pile near the shaft. Considerable work on this and surrounding pegmatites was carried out by Manitoba Tin Company, Limited in 1928 and 1929. A 33.6 m shaft was sunk on the nearby shore of the island to the east (Fig. 30), and a crosscut to the pegmatite was made. It was followed by 18 m of drifts, but only an insignificant amount of cassiterite was found.

Wright (1932) described the occurrence, which is now almost obscured. "In June, 1929, only a few square feet of the pegmatite was visible at the top of a small prospect shaft nearly full of water. Specimens in the dump are of a pinkish, albite pegmatite. Within the pegmatite a zone, approximately 2½ feet wide at the top of the shaft, contains abundant quartz and muscovite. The cassiterite occurs in this quartz-muscovite phase, in crystals up to ¼ inch long and in small grains lying either along the edges of bands or streaks wherein either quartz or muscovite are abundant, or between grains of quartz and pinkish feldspar. The pink feldspar in the quartz-muscovite phase occurs in areas with irregular outlines and lying between large grains or areas of quartz. In thin section under the microscope the pegmatite is seen to carry abundant quartz and muscovite with some albite-oligoclase, cleavelandite, microcline, cassiterite, and fluorite. Grains of quartz, muscovite, and cleavelandite penetrate the albite-oligoclase and microcline crystals, and this relationship perhaps indicates two generations of crystallization during the consolidation of the pegmatite magma. The fluorite is in small, irregular patches between large quartz and feldspar grains, suggesting a cavity filling.

"The extent of the tin-bearing, quartz-muscovite phase of the pegmatite body is unknown. It is reported that on the 100-foot [30 m] level, cassiterite was present in the normal feldspar pegmatite and that the quartz-muscovite phase, as developed at the surface, was not encountered underground." A detailed history of the deposit is available on Mineral Inventory card 52L/6 Sn1, in Bamburak (1980).

Main pegmatite area, south shore of Shatford Lake: A to I

At least seven outcrops of pegmatite occur within the metavolcanic rocks that form a projection on the south shore of Shatford Lake (Fig. 31), in an area extending 490 to 980 m southwest of the original cassiterite discovery. The pegmatites are exposed in numerous small pits and several large trenches, and are notable for their diverse mineralogy: curved Li-muscovite, beryl, monazite, altered topaz, and others. The claims were staked first in 1928, and subsequently cancelled and re-staked several times up to 1950. During this period, pits were opened up; the details are described on mineral inventory card 52L/6 Be4. The deposit was restaked as part of the Dyke group of claims in 1954 by J.J. Papineau. These were assigned to Contact Minerals Limited in 1956 and to Petromines Limited in 1966; 11 pits and trenches were opened and 433 m^3 of rock removed in 1956-57. A geological survey of the claims was made in 1968 (ESS file 91299).

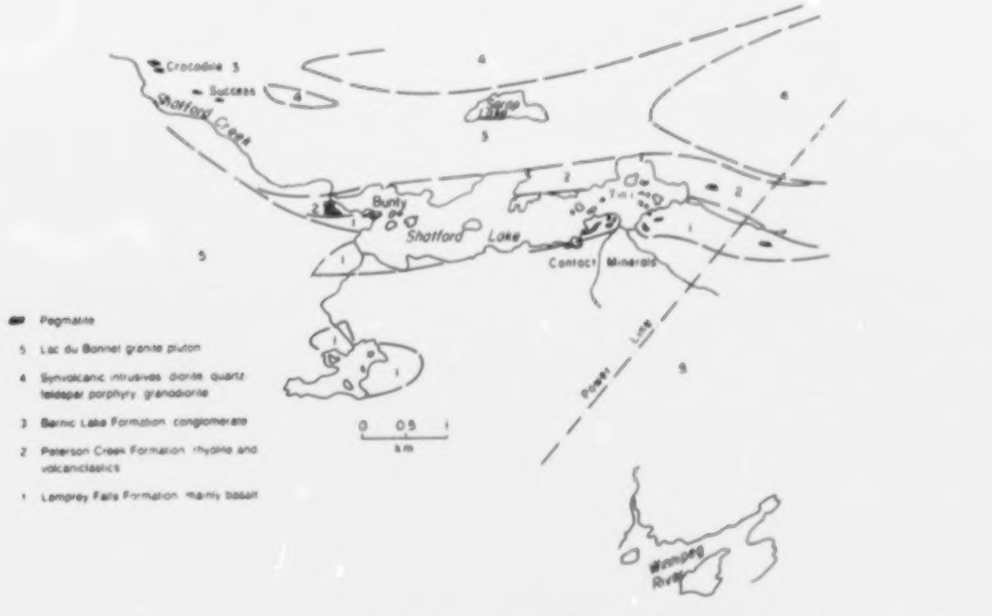

Crocodile
3
Success
4
Shatford Creek
4
Sorge Lake
5
6
2
Bunty
Shatford Lake
Tin I.
2
1
1
5
Contact Minerals
1
1
Power Line
5
Winnipeg River
0 0.5 1
km
Pegmatite
5 Lac du Bonnet granite pluton
4 Synvolcanic intrusives: diorite, quartz feldspar porphyry, granodiorite
3 Bernic Lake Formation: conglomerate
2 Peterson Creek Formation: rhyolite and volcaniclastics
1 Lamprey Falls Formation: mainly basalt

Figure 30: Regional geology and rare-element pegmatites, Shatford Lake: adapted from Davies (1957) and Černý et al. (1981).

Although the dykes are well exposed in the trenches, the intervening area is obscured, and it is uncertain whether or not the dykes are discrete bodies, or parts of one or two large dykes. The seven largest trenches or pits were examined and are described below. These are on the former Dyke 13 and 14 claims (unsurveyed).

The pegmatites, in general, consist predominantly of feldspars. Pink to buff albite occurs in large crystals and curved plates; pink to red massive perthite is abundant. Quartz is less abundant than the feldspar, but occurs in masses as large as 3 by 4 m. Zoning in the dyke is locally evident.

A A pegmatite outcrop at least 9 m wide (north contact not exposed) contains a coarse grained quartz and perthite zone near the centre, branching into two zones at the western end. One pink perthite crystal is 1.5 x 1.5 m. A dark Li-muscovite occurs as blades 2.5 x 15 cm, and also as continuous sheets along several fractures. A small amount of beryl is present, both as irregular crystals and as anhedra in a finer grained phase. On the eastern side, both pinkish and greyish albite were noted, as well as two small crystals of fluorite and one of tourmaline (a rare mineral in the Shatford Lake pegmatites).

B A small pit contains some beryl in various shades — pale white to brown, pale green, and "golden", as well as pink microcline, masses of quartz, some curved Li-muscovite and minor tourmaline.

C This pit was partially water-filled, but some pink microcline, blades of tantalite, pale green beryl in quartz and abundant red-stained feldspar were noted. This is the pit in which Davies (1957, p. 20), who saw the trenches in this area when freshly opened, described several masses of monazite, as large as 20 by 25 cm. "The monazite is dark reddish to greyish brown and contains abundant dusty hematite and small anhedral inclusions of euxenite-polycrase ... The monazite occurs in fractured feldspar which locally has been deeply reddened by hematite. The monazite content is very low."

Davies (1957, p. 20) described also, although not specifying in which part of the pegmatite, the occurrence of:

- tabular crystals of columbite in narrow fractures in feldspar and quartz;
- a small amount of pyrite and stibnite in one fracture. Černý and Bristol (1972) identified by X-ray methods one "stibnite" sample as jamesonite;
- polycrase-euxenite as small anhedra in pink albite, mixed with smoky quartz;
- topaz, in remnants of large orthorhombic crystals largely altered to fine muscovite.

D Two trenches, labelled DI and D2 in Figure 31 have been blasted into spectacular concentrations of large "zinnwaldite" masses, some more than 1 m across. The mica occurs in large, tapering

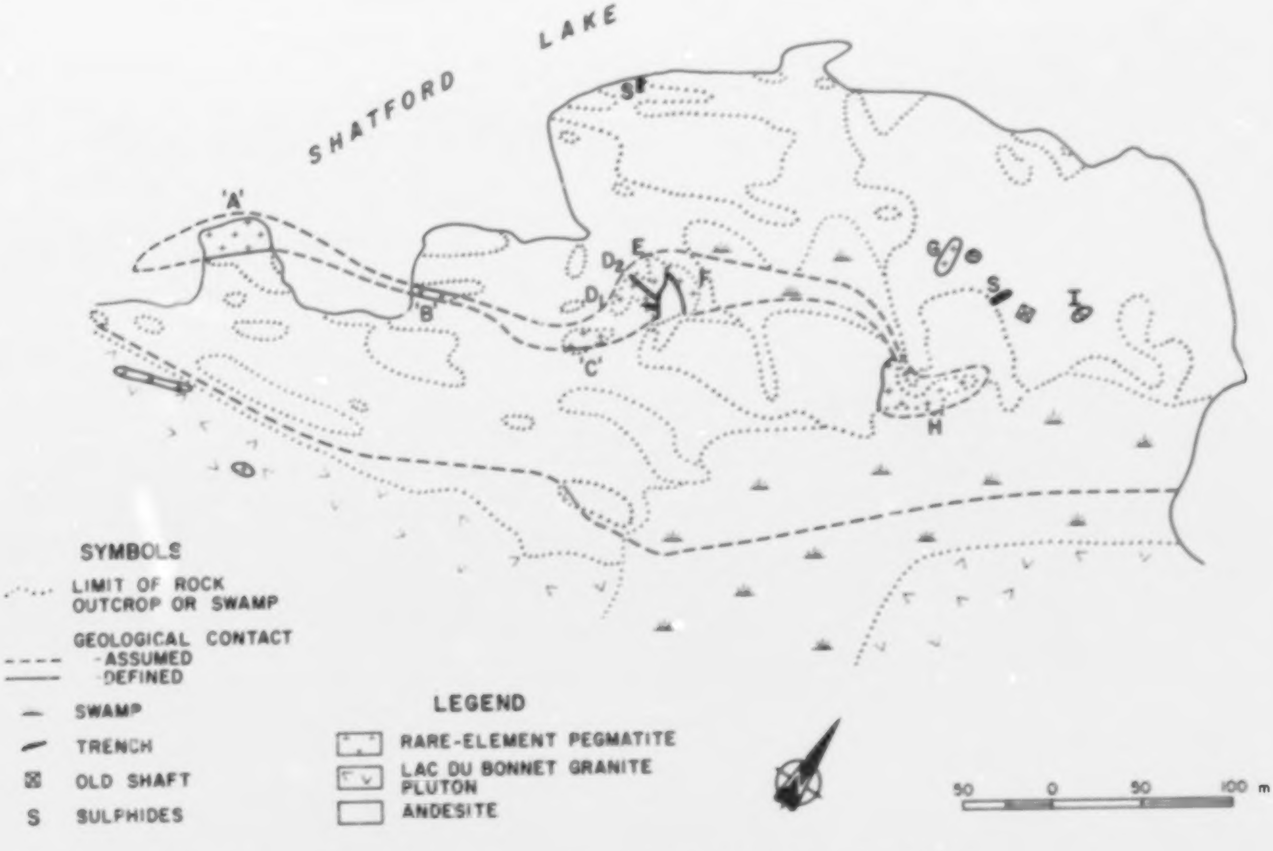


Figure 31 Geology of Contact Minerals Limited pegmatite, from Gass (1957), showing locations A to I.

Figure 32: *Curved lithian muscovite (called 'zinnwaldite' in early reports), from Shatford Lake.*

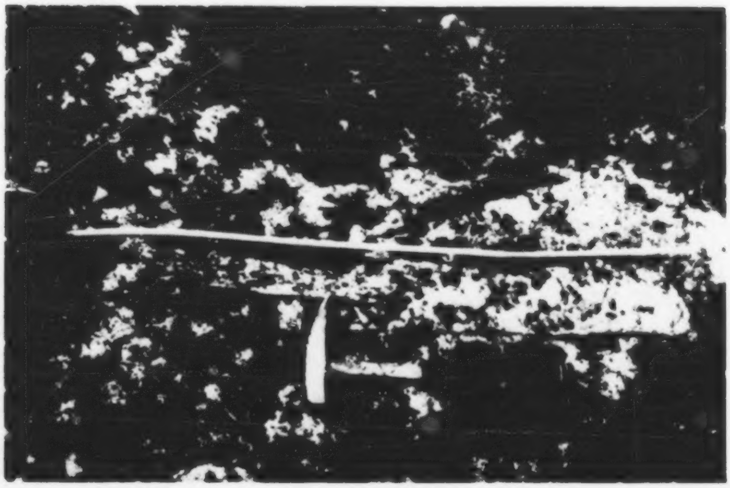


Figure 33: *Beryl crystals aggregating 72 cm in length, near trench 'F'.*

segments (Fig. 32) with a characteristic convex surface that is steel grey with a sub-metallic lustre. The segments are either isolated masses, or part of large circular masses with interstitial quartz and pink albite. Davies (1957, p. 20) notes that, for the "zinnwaldite", "Its optical properties place it in the lepidolite group, and are close to those from the zinnwaldite from Saxony." Mulligan (1965) reported "the specimens taken by the writer assayed only 0.78% Li_2O". Černý and Bristol (1972) reported that "the brownish-grey dish-like mica was found to be a 2M, muscovite with negligible Li and Fe contents". A sample of pink microcline collected from the main "zinnwaldite" area along the south side of trench D2 is slightly radioactive. An X-ray analysis of a grey stringy veinlet in the microcline revealed the presence of galena, but the radioactive source was not identified.

E: In outcrop E, a trench along the western edge exposes the south contact of the pegmatite. It is very irregular, variable in strike, and either has a very low dip or has been faulted. Some coarse grained (10 to 30 cm) albite occurs within 30 cm of the contact. The pegmatite consists of quartz + pink microcline + "zinnwaldite"; even small grains of the mica are curved. Quartz is abundant. One very pale green 12 mm beryl crystal, and minor fluorite were noted. An inclusion of the country rock separates this area from outcrop F.

F: The outcrop is a continuation of the E outcrop. A notable feature is a giant greenish beryl crystal consisting of a lower tapered section 100 mm to 76 mm wide, and 45 cm long, with a joined tapered extension 63 mm to 37 mm wide and 25 cm long. It is enclosed in pink feldspar and quartz (Fig. 33).

G: A small isolated outcrop of pegmatite, in which a shallow trench has been blasted for 6 m and an additional 6 m has been stripped. Beryl was not noted.

H: A large pegmatite, which may be a separate dyke from all previously described ones, outcrops in a cliff face along the eastern edge of the rock ridge. At the south end the dyke strikes 0°, dips 65°E, and is in contact with metavolcanics at the southern tip, and farther north with biotite schist containing bands of sulphide minerals, including pyrrhotite and chalcopyrite. The pegmatite is mainly a very even textured medium grained pink feldspathic dyke with some quartz, white feldspar, and mica (in the form of curved books 12 mm to 12 cm long, and up to 9 cm wide in clusters). At the top of the rock ridge, the dyke strikes 320° and dips 75°NE; the metasediments strike 250° and dip 70°N. In a few places, coarse grained feldspar, 10 to 12 cm across, is present. On the south wall of a trench across the north end of the dyke, light green beryl crystals, up to 25 mm aross and 9 cm long, are concentrated along or near the contact with the wall rock.

I: A narrow vertical dyke, striking north, outcrops down a shallow sloping ridge over a length of 15 m, but has not been trenched.

Another feature of the pegmatites on the Dyke claims 13 and 14, as reported by Davies (1957), is the occurrence of beryl, in a hexagonal shell outline, surrounding a core of albite. Davies also estimated the average beryl content to be considerably less than 0.25 per cent.

Gadolinite has been identified from the pegmatite exposed in the trenches (Mulligan, 1968).

Pegmatite dykes in quartz monzonite, Dyke 5 claim

Pegmatites containing beryl intrude the Lac du Bonnet biotite quartz monzonite pluton (McRitchie, 1971a), the north border of which outcrops close to the south shore of Shatford Lake. One dyke, outcropping over a length of 45 m up the slope of a granitic rock ridge, is located 70 m south of outcrop 'A' described in the previous section. The dyke has a width of 1.8 m, has a fine grained border phase, and consists mainly of very coarse grained quartz and perthite. Beryl crystals, from 12 to 50 mm across, are present, and occur in clusters, usually abundant where masses of quartz occur. One crystal has a transparent pale yellowish colour, an altered crystal of topaz, some micaceous patches, and one small black tantalum mineral also were noted. A second, smaller dyke outcrops 7.5 m to the northwest, and contains some small flakes of "zinnwaldite". Černý et al. (1981, p. 111) report gem quality brownish-yellow topaz in this dyke.

Another pegmatite, containing abundant deep red-stained feldspar and quartz, outcrops 45 m west of the first dyke. It contains pockets of soft, weathered, friable pyrite, but rare-element minerals were not observed.

Pegmatites on Dyke 12 claim, south of Tin Island

Several pegmatite dykes outcrop on the former Dyke 12 claim, on the south shore of Shatford Lake, south of Tin Island.

The pegmatite of greatest interest outcrops as a low ridge, north of the main outcrop area of metavolcanics, 245 m due south of Tin Island. The metavolcanics strike at 95° and dip steeply to the north. The pegmatite dyke is 2.4 to 3.4 m wide. It strikes 50° at the western end, swinging to 30° at the centre of the exposure.

The dyke has a chilled margin 6 to 12 mm wide, and a fine grained albitic wall zone 6 to 12 mm wide. The main part of the dyke consists of 12 to 50 mm grains of pink and white albite + quartz. Beryl occurs as greenish translucent crystals 6 to 36 mm in diameter, and up to 36 mm long. A large radiating cluster of rare earth and Ta minerals is well exposed (Fig. 34). Černý and Bristol (1972) reported "fan-shaped black aggregates of niobium-rich pseudo-ixiolite partly replaced by yellow pyrochlore-microlite", which are slightly radioactive. Rare "fibrous metamict allanite mostly altered to greyish-green bastnaesite" also is present, as well as "tiny black laths of yttrotantalite". The longest needle in the mass was measured at 28 cm. Large 56 by 20 cm megacrysts of microcline-perthite occur only 15 cm away. Some lithian mica occurs in curved books 7.5 cm across. In this study, tapiolite and bastnaesite were identified. Černý et al. (1981) list also rare topaz, euxenite, apatite and monazite.

Two narrow dykes, 45 cm and 75 cm wide, occur in the metavolcanics. One is an offshoot of the main dyke, and strikes 55°.

Another pegmatite outcrop, 22 by 4 m, occurs down strike from this dyke, along the shore of the lake. The dyke is similar to the main dyke, except for the presence of 30 cm-wide patches of aplite studded with small red garnets, and also some coarser garnets to 6 cm in the medium grained pegmatite. Beryl was not observed.

In the metavolcanic outcrop area 85 m to the southeast, a pink pegmatite occurs in several outcrops over a length of 120 m. The dyke strikes 55°, dips 85° southeast and is 2.4 m wide at its widest point. It consists mainly of medium grained feldspar + quartz + silvery mica in slightly curved books. Both albite and microcline occur, along with minor beryl. Two small pits have been blasted into the pegmatite near its southwestern end.

The most southerly dyke is irregular in shape, and is exposed over a length of 30 m. It is near the metavolcanic-quartz monzonite contact, and bends from 230° to 260° to 335°, parallel to that contact (Fig. 30). Its mineralogy and texture is similar to the pegmatite 'A' outcrop described for the main pegmatite area to the west (Dyke 13 and 14 claims), and it similarly contains yellowish beryl anhedra and distorted to curved plates of silvery black mica. A dip of 40°N was noted on the eastern part of the dyke.

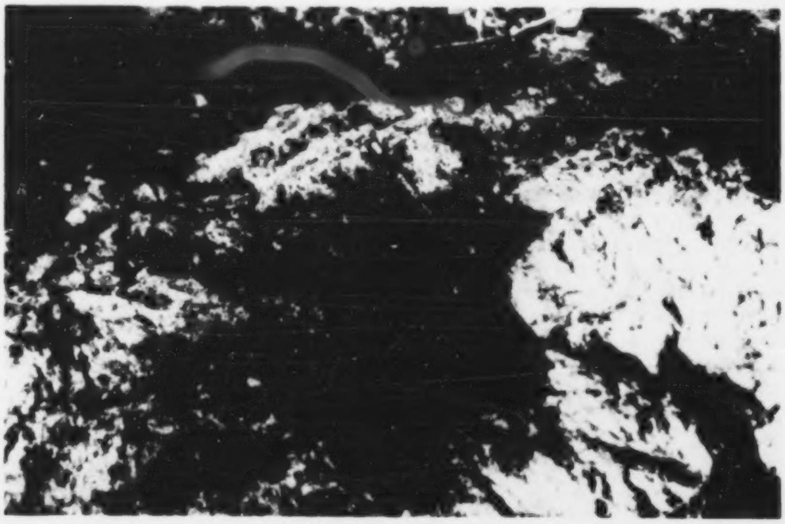


Figure 34 *Radiating crystals of pseudo-ixiolite, with allanite altered to bastnaesite, Dyke 12 claim, Shatford Lake.*

Pegmatites east and southeast of Shatford Lake

Davies (1957, p. 20, 21) reported beryl pegmatites located in the areas 300 m east and 1.2 km southeast of Shatford Lake (Fig. 30). As these were not examined in this study, Davies' description is quoted:

> "Several small dykes, about 1,000 feet [305 m] due east of the end of Shatford Lake contain a few crystals of green beryl. These dykes occur in silicified rocks.
>
> Another beryl dyke occurs about 4,000 feet [1220 m] southeast of the east end of the lake. This pegmatite intrudes pillowed lavas, and is exposed in two places for lengths of 125 and 150 feet [38 and 46 m], respectively. The total length is probably about 600 feet [183 m]. The maximum width is about 15 feet [4.6 m].
>
> "The dyke is uniformly coarse grained and consists mainly of large pink feldspar crystals with the remainder, milky white quartz, and books of biotite, zinnwaldite, and yellowish-green mica. Feldspar comprises about ⅔ of the mineral content. Some of the quartz is in large patches a foot or more across.
>
> "Yellow-green beryl crystals are scattered throughout the dyke. Some columbite is present, and a little purple fluorite is found in places."

Černý and Bristol (1972, p. 561) noted that in this pegmatite:

> "Both microcline-perthite and albite are abundant .... and pale-blue to violet apatite is a frequent accessory constituent. The mica reported as zinnwaldite is a 2M, muscovite with very subordinate Li and Fe percentages. In the central parts of this pegmatite large columnar crystals of water-clear or milky topaz were found, attaining up to 30 cm in length and 12 cm across. Their outer parts are usually replaced by yellowish-green mica but some are almost perfectly preserved."

Bunty claims, western end of Shatford Lake

Several pegmatite dykes containing beryl cut metavolcanics along the southern part of the point extending into the western end of Shatford Lake. The main showing of beryl, and the only trenched dyke, was mapped at a scale of 1:120 (Fig. 35).

The contact is well exposed in the pit and strikes 66°, almost conformable with the strike of the wall rock. However, the metavolcanics dip 55°N, whereas the pegmatite dips 60° or less to the south. The dyke has well defined aplite borders, even around smaller xenoliths. Some of the aplite is banded. Two areas with large concentrations of beryl crystals were mapped; small ixiolite crystals are associated with the beryl. The dyke is mainly a medium grained feldspar + quartz + mica pegmatite, with coarse grained patches in which pink microcline is the dominant feldspar.

In the western pit, near the base of the rock ridge, one area of massive glassy quartz 60 cm across is associated with well developed crystals of microcline. Small beryl anhedra occur along the edge of one large microcline crystal.

In the main trench, blasted into the south side of the cliff, the beryl is generally a creamy to yellowish colour. Some large crystals up to 25 cm across were noted in the rockpile near the western end of the trench.

Downslope and southeast of the east end of the Bunty pegmatite, another pegmatite at least 10 m wide is exposed at the shoreline. If it is an eastern continuation of the main dyke, it has probably been offset to the south, although the shallow dip could account for the exposure at the base of the cliff. This dyke also has aplite borders, and contains a number of hexagonal white and green beryl crystals, as large as 4 cm across and 9 cm long. It contains pink and grey feldspar, a substantial amount of mica, and is exposed for a length of 20 m. It dips 50° to 60° south, and has been trenched.

Černý et al. (1980) have identified pseudo-ixiolite and microlite from the Bunty pegmatite.

Pegmatitic granite at northwestern end of Shatford Lake

An extensive exposure of pegmatitic granite occurs west of the bay at the northwest end of Shatford Lake, south of Shatford Creek. The texture of the rock is somewhat similar to that of the pegmatitic granite northwest of Greer Lake, but with a smaller amount of the aplite phase, which is here banded mainly with quartz crystals. The banded aplite shows pronounced contortions. Perthite megacrysts up to 40 cm on each edge are present, as well as intergrowths of K-feldspar and quartz, with quartz occurring as lenses in the microcline.

One impressive concentration of 40 or more beryl crystals within a 2 m square area was noted along the northwestern edge of the outcrop. Pits on the east side of the exposure also contain numerous beryl crystals, and a few small "tantalite" grains.

Černý et al. (1981) have mapped this occurrence as pegmatite rather than pegmatitic granite; they report rare pseudo-ixiolite

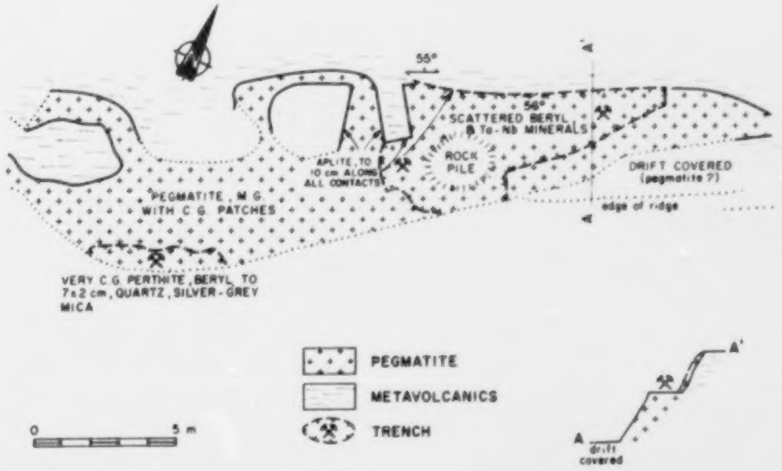

55°
56°
SCATTERED BERYL & Ta-Nb MINERALS
APLITE, TO 10 cm ALONG ALL CONTACTS
ROCK PILE
DRIFT COVERED (pegmatite ?)
edge of ridge
PEGMATITE, M.G. WITH C.G. PATCHES
VERY C.G. PERTHITE, BERYL TO 7x2 cm, QUARTZ, SILVER-GREY MICA
PEGMATITE
METAVOLCANICS
TRENCH
0
5 m
A
A'
drift covered

Figure 35: Bunty pegmatite, western end of Shatford Lake

PEGMATITES IN SHATFORD CREEK-BIRD RIVER AREA

Crocodile and Success pegmatites

Thin pegmatite dykes containing beryl and cassiterite (Fig. 30) occur 3 km northwest of Shatford Lake (Mineral Inventory cards 52L/5. Sn 1 and Sn 2. in Bamburak. 1980). Cassiterite was first reported in 1928.

The Crocodile deposit is described by Bateman (1943). It consists of two shallow-dipping pegmatites 4 m apart; they range in width from 50 cm to 1 m. The upper. easterly dyke is 85 m long. thinning at each end; the lower dyke is 45 m long. tapering at the east end. The dykes consist of albite. quartz. and muscovite. with minor cassiterite. garnet and beryl. An "albite" phase forms the central part of each dyke. Channel samples of the dykes taken in 1942 assayed 0.08% Sn and 0.15% Sn. respectively. Small amounts of indicolite, molybdenite and sphalerite were noted by Bateman in the lower dyke.

The Success dyke. located 400 m east of the Crocodile. is about 30 cm thick. and consists of quartz. albite. and minor beryl in small crystals. Cassiterite crystals up to 5 mm long were reported by Bateman (1942). The dykes are not easily accessible (perhaps the best method being by canoe from Bird River up Shatford Creek).

Holy Bible pegmatite, southeast of Bird River bridge

A pegmatite dyke containing beryl and molybdenite was mapped by Davies (1952. Map 51-3) 2300 m southeast of the Bird River bridge (Fig. 36). Černý and Turnock (1971. p. 124) named this the "Holy Bible (HB) pegmatite" (a bible camp is located north of it) and noted:

"This occurrence is located in the metavolcanic belt between Shatford Lake and Lac du Bonnet. very close to its contact with the large granitic area to the south. The pegmatite body strikes east-west and dips steeply northward. concordant to the foliation of the enclosing basic metavolcanic rocks.

"The pegmatite. sharply bounded against the wallrock. lacks any regular zoning. Reddish aplite and blocks of K-feldspar alternate with patches of albite and quartz. The latter cross-cuts all other assemblages and minerals in narrow north-south trending veinlets. Beryl and molybdenite seem to be the only accessory minerals. the lack of micas is conspicuous.

"In its geochemical (Be. Mo) and structural character. this pegmatite is a unique body different from all other occurrences in the Cat Lake-Winnipeg River area." Rare pseudo-ixiolite occurs in the dyke (Cerny et al.. 1981).

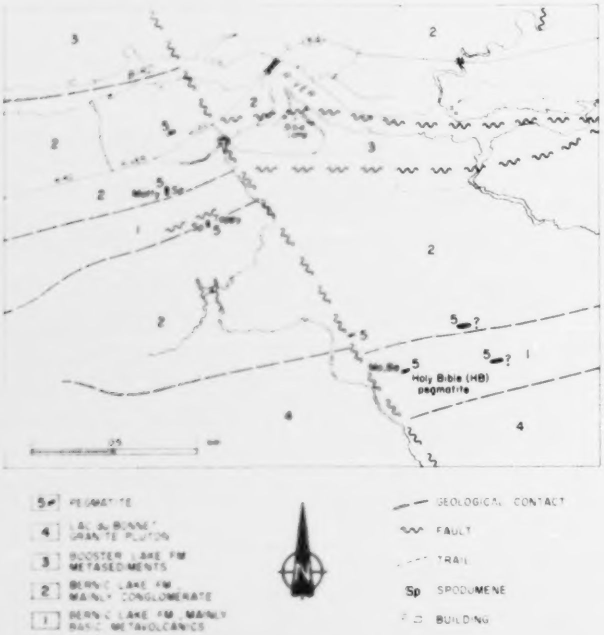

Matty
Sp
Holy Bible (HB) pegmatite
5 PEGMATITE
4 LAC du BONNET GRANITE PLUTON
3 BOOSTER LAKE FM METASEDIMENTS
2 BERNIC LAKE FM MAINLY CONGLOMERATE
1 BERNIC LAKE FM, MAINLY BASIC METAVOLCANICS
GEOLOGICAL CONTACT
FAULT
TRAIL
Sp SPODUMENE
BUILDING
N

Figure 36. Rare-element pegmatites near Bird River bridge: geology from Černý et al. (1981).

During the present survey. beryl-bearing pegmatites were found in this area. The main dyke outcrops on the south slope of a long jack pine-covered ridge of schistose metasediments. on the top edge of a 3 m high cliff. It has not been trenched. although a few blocks of broken pegmatite are present. The dyke strikes 290°. dips vertically or slightly to the south. is 1.2 to 3.6 m wide. and outcrops over a length of 15 m. The assemblage is similar to that described by Černý and Turnock (aplite. blocky K-feldspar. quartz. both saccharoidal and massive). but only three beryl crystals. each 12 mm across. were noted at the east end of the outcrop. Some small specks and one 3 mm grain of a tantalum-bearing mineral occur with the beryl. The massive quartz occurs in irregular patches approximately along the centre of the dyke. Granitized gneiss outcrops on the northwest side of the dyke.

A parallel dyke outcrops 10 m to the northeast. is at least 1.2 m wide. has a similar strike. and is poorly exposed. Two yellowish translucent beryl crystals were noted.

As molybdenite was not observed in either dyke this may not be the same occurrence as described previously. However. it is possible that visiting geologists and prospectors have removed the most easily visible molybdenite. or that it was overlooked.

Two other pegmatites outcrop 365 m and 388 m at 305° from the cliff outcrop. They are quartz-feldspar dykes with silvery mica and accessory garnet and apatite. They have not been trenched. and rare-element minerals were not observed. Černý et al. (1981. p. 76) have mapped another beryl-bearing pegmatite about 2 km east of their HB pegmatite.

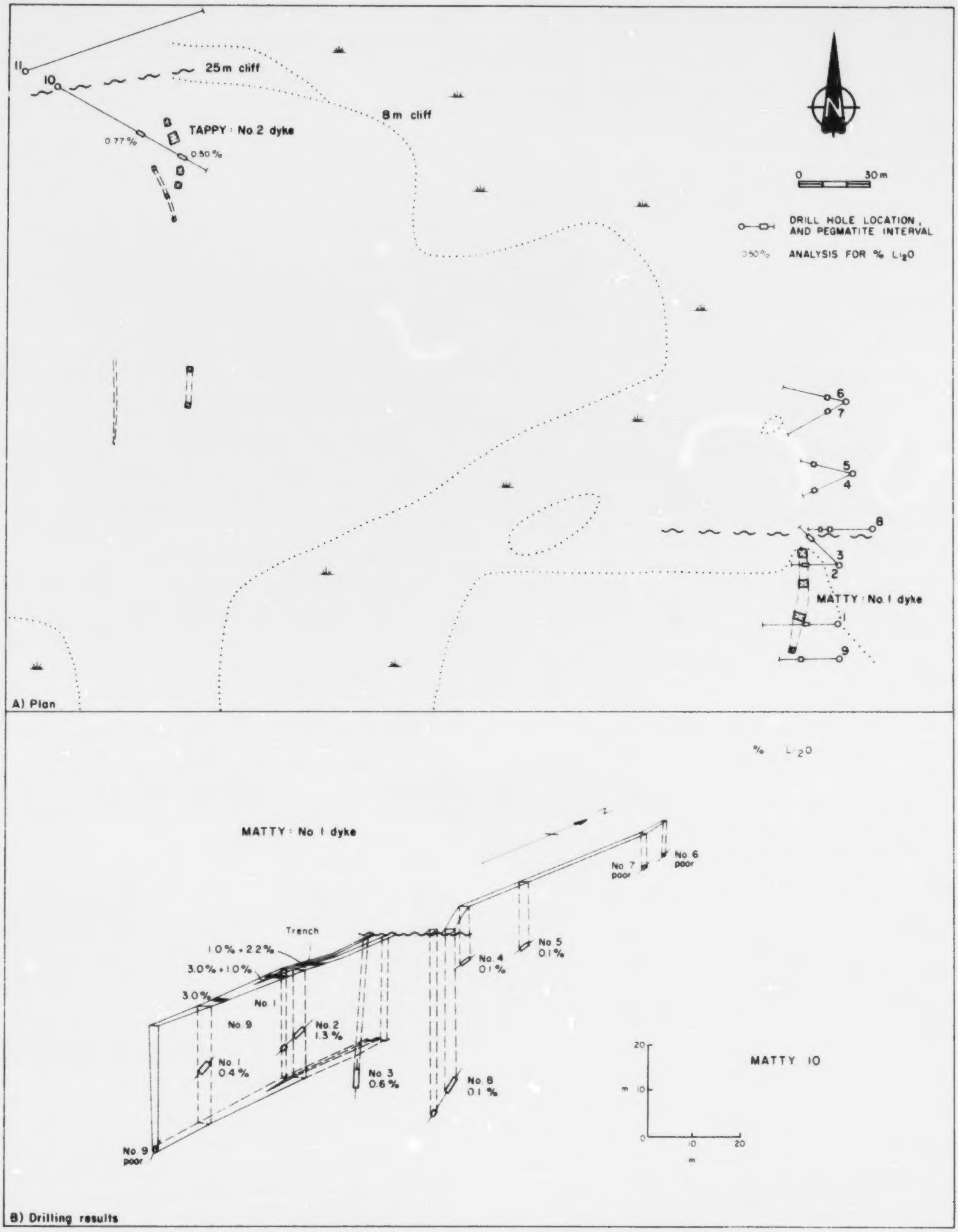
Matty and Tappy pegmatites

Outcrops of spodumene-bearing pegmatite occur on the rock ridges 1 km southwest of the Bird River bridge. and south of P.R. 315 (Fig. 36). The dykes were originally staked in 1941 and 1942. and restaked in 1955. They were assigned to International Base Metals Ltd. in 1957. and later restaked by Robert Sellars and Donald Sellars (see Mineral Inventory card 52L/5 Li 1). Considerable trenching and 13 drill holes have been reported as assessment work (ESS file 91092).

Most of the drilling was done on the "#1 dyke" on the Matty 10 claim (Fig. 37). The dyke is exposed at the top and down the slope of a ridge of granitized metasediments with some metavolcanics. which it transects at approximately right angles. It is exposed in 4 trenches over a length of 50 m, and the rock ridge rises 9 m above the surrounding swamp. At the south end. the dyke strikes 5°. and is vertical. and the drill holes indicate a continuation of this orientation. Its width ranges up to 3.5 m. but it pinches out at the south end. Strongly developed joints cut the dyke at 350°. dipping 35°S. Rather than zoning. the dyke exhibits an irregular mixture of phases:-

1) fine grained bluish aplite and saccharoidal white very fine grained pegmatite;

2) fine grained mica-rich rock;



25m cliff
8m cliff
TAPPY: No.2 dyke
0.77%
0.50%
0 30m
DRILL HOLE LOCATION, AND PEGMATITE INTERVAL
0.50% ANALYSIS FOR % Li_2O
11
10
6
7
5
4
8
3
2
1
9
MATTY: No 1 dyke
A) Plan
% Li_2O
MATTY: No 1 dyke
Trench
1.0% + 2.2%
3.0% + 1.0%
3.0%
No 1
No 9
No 2
1.3%
No 1
0.4%
No 3
0.6%
No 8
0.1%
No 4
0.1%
No 5
0.1%
No 7
poor
No 6
poor
No 9
poor
MATTY 10
20
10
0
m
10
20
m
B) Drilling results

Figure 37: *Matty and Tappy pegmatites: plan and drilling results (derived from data in ESS file 91092)*

3) spodumene-rich patches, most, but not all, along the joint planes. The spodumene shows stressed surfaces and in places is sharply curved;
4) coarse grained pink and grey feldspar, in patches, that may change along the joints to fine grained patches of quartz + feldspar + mica.

Areas of highest spodumene content assayed 3.5% Li_2O over 2.44 m and 1.0% Li_2O over the adjoining 1.1 m in one trench, and averaged about 2% Li_2O for three of the trenches. The drilling results traced the extension of the dyke an additional 30 m along strike, under the muskeg area north of the rock outcrop. The dyke thins to 30 cm with low lithium content (0.1 to 0.6% Li_2O) in the northern part, which may be offset by a fault (Fig. 37). The best intersection in the drilling was a grade of 1.3% Li_2O over a width of 3.1 m in hole #2 below the outcrop. The results indicate that the dyke is somewhat thinner and contains less spodumene at depth.

The other major pegmatite outcrop is the #2 dyke, located on the Tappy 2 claim, 240 m south of P.R. 314. It is exposed for 30 m only on the top of the ridge of metasediments and metavolcanics which strike 255° and dip vertically. The dyke strikes due north, dips 85°W and ranges in width from 2 to 3.6 m, but apparently pinches out south of the main exposure. At the southern end the dyke bifurcates into two narrow dykes, and another 60 cm pegmatite occurs offset but parallel to the main dyke. On the cliff face at the north end, the dyke narrows to 1.2 m about 6 m below the top of the steep cliff face, where both contacts dip 70 to 75° west. Several pits have been blasted into the dyke, particularly in areas of spodumene concentrations.

The dyke shows a rough zoning in places with a border zone of fine grained quartz + pink and grey albite, and a wall zone of coarse grained white K-feldspar with pink edges, and accessory muscovite. The central part is a medium- to coarse-grained spodumene + quartz core, characterized by clusters of coarse spodumene crystals, from 6 to 100 mm long, and up to 75 mm wide. Some crystals have perfectly flat faces, whereas others show a curved, stressed face, possibly related to the pronounced jointing, striking 130°, that is evident in much of the dyke. The north contact appears offset about 60 cm along a joint.

Aplite occurs mainly close to the walls, but has an irregular distribution, as it forms patches up to 2 m across in the centre of the dyke. Spodumene crystals are concentrated along the contacts with the aplite. The aplite is micaceous in part, including 6 mm grains of steel-grey curvilamellar lithian muscovite. Some pink cleavelandite is present in the feldspar + quartz + mica zone, and some accessory apatite occurs. Some triphylite and a green micaceous alteration were also noted. Černý and Turnock (1971) noted triphylite-lithiophilite, oxidized to Mn-sicklerite (their "Lac du Bonnet spodumene pegmatites").

One horizontal drill hole, drilled into the cliff face (Fig. 37, D.D.H. 10) intersected two pegmatite invervals, one grading 0.7% Li_2O over 2.1 m, the other 0.5% Li_2O over 3.5 m. Three drill holes along strike between the cliff and P.R. 315 intersected only stringers of pegmatite, 0.1 to 1.1 m wide.

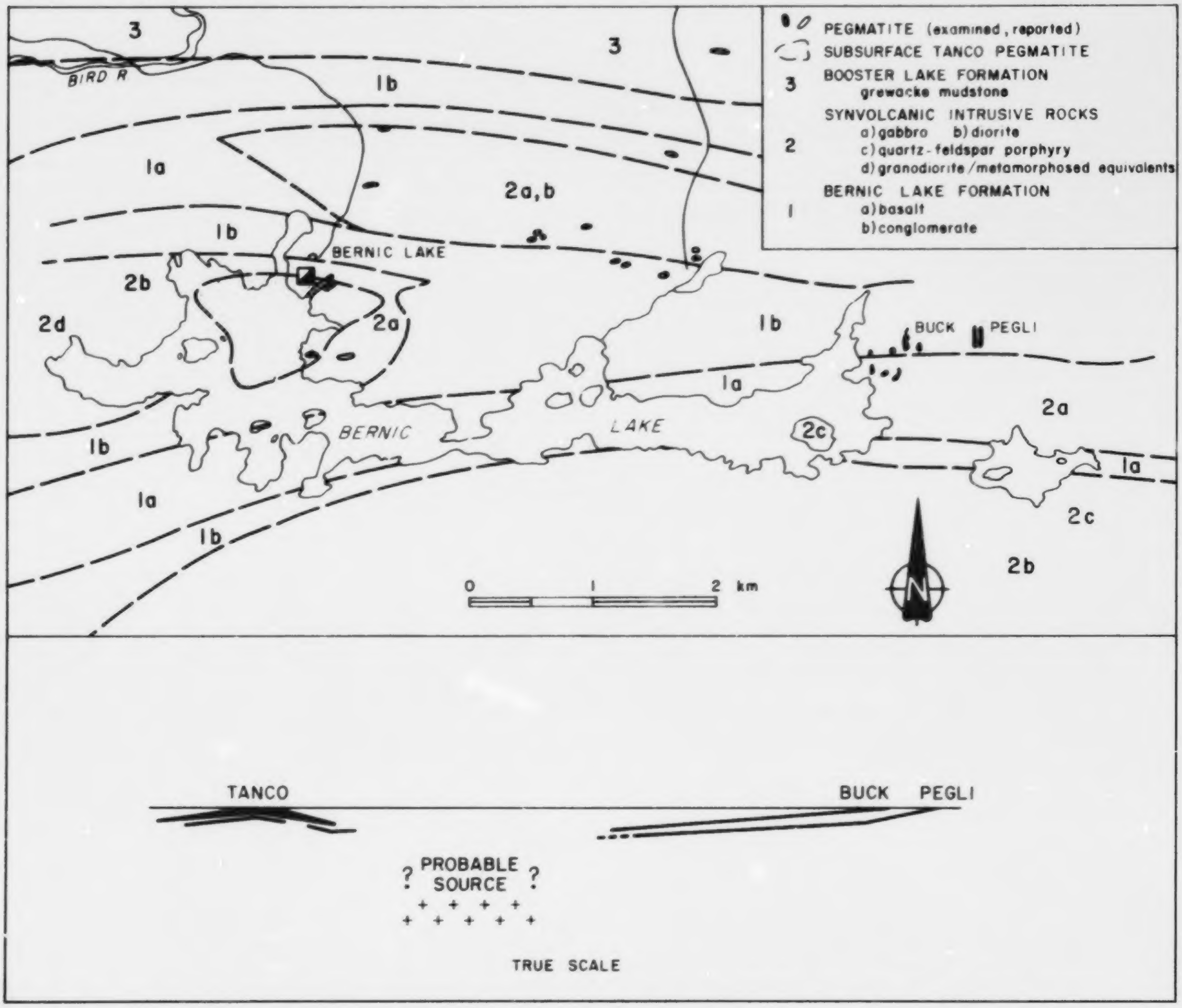
Three small parallel pegmatites outcrop north of P.R. 315, on Tappy 1, about 300 m north of the cliff on Tappy 2. The dykes are less than 1 m wide, spodumene is reported by Černý et al. (1981), and some yellowish green lithian muscovite is present. The company reported assay values of up to 0.9% Li_2O on selected samples.

These dykes are fine grained to aplitic; the widest, towards the west, appears to line up with the outcrop of pegmatite south of the road. It strikes 350° and dips vertically or slightly west, and can be traced across the 9 m high outcrop of metasediments. It consists mainly of fine grained grey to white albite, with quartz blebs and has a banded appearance. It thins to 60 cm down the south face of the rock ridge.

PEGMATITES AT BERNIC LAKE

A number of small surface pegmatites were discovered in the 1920s at the northwestern and eastern ends of Bernic Lake. They contain cassiterite and beryl in the former, and a variety of lithium minerals and minor beryl and cassiterite in the latter.

Subsequent drilling revealed the presence of very large, highly fractionated, lithium-rich pegmatites injected into subhorizontal dilational fractures, possibly from a common source as postulated by Černý et al. (1981) below and north of the central part of Bernic Lake (Fig. 38). The northwestern property is the Tanco pegmatite, containing Li (spodumene, amblygonite, lepidolite, etc.), Ta, Cs, Be, Ga and Rb in quantity. The deposit may contain over 50 million tonnes of pegmatite. In addition, underlying layers have been intersected below the Tanco pegmatite. The dykes at the eastern end of Bernic Lake contain Li (spodumene, petalite, amblygonite) minor Be and rare Ta; two subhorizontal pegmatites may contain as much as 5 million tonnes of pegmatite in each layer; the full dimensions of the eastern dykes have not been established, and it is possible that more pegmatites may be present at depth. This very large quantity of pegmatite dwarfs the other pegmatite-pegmatitic granite relationships known in the Winnipeg River-Bird Lake region, and suggests the presence of a large pegmatitic granite pluton at depth. Conversely, as these highly fractionated dykes lie above the suspected source pluton, it may be conjectured that somewhat similar rare-element enriched pegmatites existed at one time above other nearby pegmatitic granites, but have since been eroded, victims of parental exposure.



PEGMATITE (examined, reported)
SUBSURFACE TANCO PEGMATITE
3 BOOSTER LAKE FORMATION
grewacke mudstone
2 SYNVOLCANIC INTRUSIVE ROCKS
a) gabbro b) diorite
c) quartz-feldspar porphyry
d) granodiorite/metamorphosed equivalents
1 BERNIC LAKE FORMATION
a) basalt
b) conglomerate
3
BIRD R
1b
1a
2a,b
BERNIC LAKE
2b
2d
2a
BUCK
PEGLI
1a
2a
2c
BERNIC
LAKE
1b
1a
1b
2c
2b
0
1
2 km
N
TANCO
BUCK
PEGLI
? PROBABLE SOURCE ?
TRUE SCALE

Figure 38: *a) Bernic Lake pegmatites (geology from Černý et al., 1981); b) probable location of postulated source (adapted from Černý et al., 1981).*

TANCO PEGMATITE, NORTHWESTERN PART OF BERNIC LAKE

The Tanco pegmatite is one of the world's major zoned rare-element pegmatites. It has been the source of tantalite concentrates since 1969. Abundant detailed information on the deposit is available, as the result of detailed exploration and extensive underground development by Tanco, and more than a decade of intensive mineralogical and geochemical studies carried out primarily at the Department of Earth Sciences and the Centre for Precambrian Studies, University of Manitoba, following earlier reports by various authors noted below.

The following description outlines the history of development and refers to the major geological reports. The economic significance of the dyke also is documented.

A detailed history of the deposit is given in Mineral Inventory cards 52L/6 Sn 2, Li8, Cs 1, and Ta 1 in Bamburak (1980); events are described in chronological order under the various commodities that attracted interest in the property.

In 1928 the Akmen claim was staked by Charles Lebert, and later assigned to Jack Nutt Mines Limited (Consolidated Tin Corporation Limited as of May, 1930). Assays of samples from the area ranged from 1.36 to 6.93 per cent tin. A two-compartment shaft was sunk to 41 m, and four holes were drilled, at least two of which intersected a subsurface pegmatite at a depth of 75 m in which the occurrence of spodumene was recognized.

A 9-tonne pilot mill was constructed, and at least 1330 kg of tin concentrates averaging 67.3 per cent tin was produced before the operation closed. A trial shipment of 454 kg of beryl ore, assaying "4% beryllium", was made to the United States. A map of the property at that time, made by McCartney (1930) is reproduced as Figure 39, as most of these dykes are now obscured by the present surface plant and tailings. The pegmatites with cassiterite were only narrow dykes, either off-shoots of larger dykes or separate narrow dykes with maximum width of 75 cm (McCartney, 1930).

The property claim was allowed to lapse and was restaked four times, before it was assigned to Stan McLeod, a Winnipeg prospector, in 1955, who together with George McCartney staked 12 claims in the area. After drilling a 122 m hole that intersected pegmatite with a good grade of lithium, their property was assigned to Montgary Explorations Limited. An additional 7900 m of drilling in 40 holes was completed by that company by 1956, outlining 7 150 000 tonnes of lithium ore grading 1.85% Li_2O. (These figures have been revised several times, and official reserves as of December 31, 1982, are given in Table 4).

Sinking of a three-compartment shaft began in 1956, and reached 93 m. In early 1957, The American Metal Company of Canada took out an option on the property, and drilled an additional 2000 m in 22 holes. The company dropped its option just shortly before cesium-rich pollucite was identified during analysis at the University of Toronto of samples submitted by R. Hutchinson. Pollucite was recorded in five drill holes over the thicknesses of 1.2 to 11.9 m (Hutchinson, 1959, Brinsmead, 1960). The mine was shut down from the fall of 1957 to the spring of 1959.

Geological reports of the Bird Lake-Winnipeg River area were published by Davies (1955, 1957, 1958), summarizing early results of the drilling, and Hutchinson (1959) wrote the first detailed report on the geology of the Montgary (now Tanco) pegmatite.

The mine re-opened in 1959, and drifting on the '285' level eventually made accessible the spodumene, lepidolite and pollucite zones and material from these zones was stockpiled. Some 3600 tonnes of

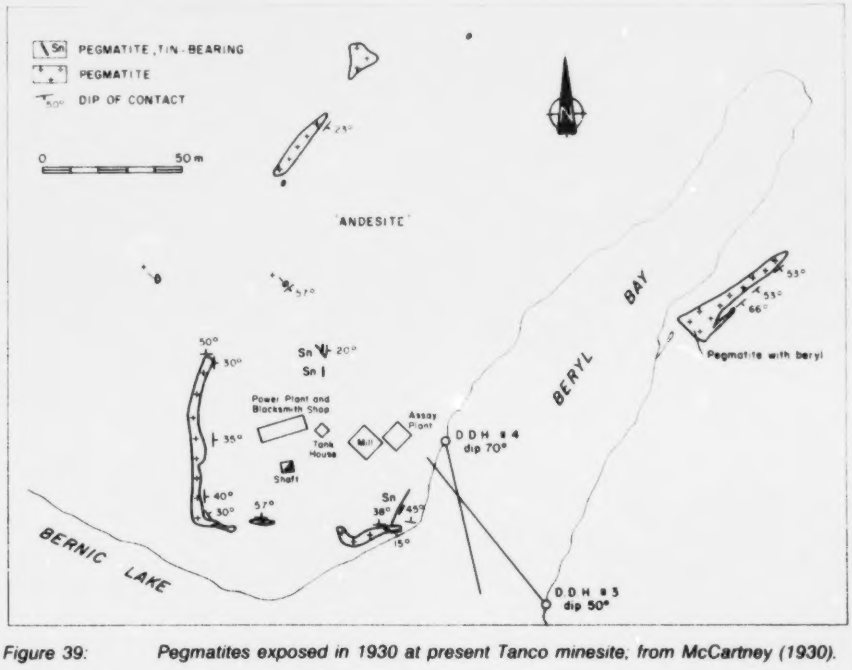


Figure 39: Pegmatites exposed in 1930 at present Tanco minesite; from McCartney (1930).

Table 4: Tanco pegmatite: Compiled reserves, December 31, 1982

	Tons	Tonnes	Grade
Tantalum —			
a) Underground	1.154.000	1 047 000	0 144% Ta O
b) Tailings	743.000	647 000	0 065% Ta O
Preproduction	2.071.358	1 879 136	0 216% Ta O
Lithium —			
a) Spodumene zone	7 349 778	6 667 719	2 75% Li O
b) Lepidolite	107 700	97 705	2 24% Li O
a) Main pollucite zone	350 000	317 520	23 89% Cs O
b) Additional "drill-indicated"	60 000	54 430	Slightly lower grade
c)	160 000	145 150	5% Cs O
Beryllium —	920 000	834 625	0 21% BeO
Gallium — In tailings	743 000	674 000	Est 1 6 oz /ton
Quartz —	780 800	708 340	n a

In addition it is reported that the lepidolite reserves contain nearly as much rubidium as lithium as well as a few hundred ppm of gallium

amblygonite was shipped to West Germany in 1959-1960, and a few thousand tonnes of quartz were sold for use as a decorative aggregate A shipment of beryl was made to the United States in 1959

Extensive testing of the spodumene began both on beneficiation methods and on uses of the material, including low-iron spodumene for ceramic use.

In mid-1959, sampling of the albitic aplite (or saccharroidal albite) determined that representative samples assayed 0 1% Ta and 0 01% Nb The presence of tin and gallium was also determined The company's name was changed to Chemalloy Minerals Limited

By mid-1960, 2060 tonnes of pollucite had been stockpiled on surface The shaft was deepened to 103 m, 1840 m of drifting was completed, and 149 underground holes were drilled by Chemalloy In 1961, an additional 544 tonnes of quartz was removed, and in early 1962 an additional 91 tonnes of pollucite was mined The mine was then closed and allowed to flood

Tantalum Mining Corporation of Canada Limited (Tanco) was formed in 1967 A period of complex financial history followed (for details see Mineral Inventory card 52L/6 Ta 1, in Bamburak, 1980) and in 1972, ownership was divided between Chemalloy (50 1%), Kawecki Berylco (24 9%) and Manitoba Development Corporation (25%) In 1977, the present ownership was established Hudson Bay Mining and Smelting Co Ltd (37 5%), Kawecki Berylco (37 5%), and Manitoba Development Corporation (25%)

Tanco had the mine dewatered in 1967, and tested bulk samples of tantalum ore An additional 109 holes were drilled and the ore reserves established Shipments of tantalite concentrates began in August, 1969 The ore is recovered, after extraction of the top slice of the ore body, by benching in horizontal slices on a room and pillar pattern, access is from a ramp decline with a 20% grade The shaft was deepened to 168 m. This system allows flexibility in following rapid changes in the ore boundaries both horizontally and vertically Two ore zones are mined, the largest being the shaft ore body (300 x 122 m, and 15 m thick on average) and a second being the west ore body (125 x 105 m, and 14 m thick on average) Drilling in 1971-1972 outlined additional tantalum mineralization in an underlying pegmatite The record of tantalum production is listed in Table 1 An aerial view of the mine site, taken in 1973, is shown in Figure 40

Between 1969 and 1975, shipments of pollucite were made primarily to the U S S R , with other shipments going to Europe, U S A and Japan (see Table 1) Since late 1976, export to communist countries has been prohibited, shipments continue to be made to other countries

Early mineralogical studies and geological studies on the pegmatite are those by Hutchinson (1959), Nickel (1960, 1961) and Wright (1961, 1963) An additional geological study was made by Armstrong (1969), and an economic study by Howe and Rowntree (1967) Methods of production of cesium metal and compounds were determined, and also of tantalite concentrate (Raicevic, 1968) The concentrator is described by Flemming, et al (1982) Thesis studies by Bristol (1962), Černá (1970, on amblygonite-montebrasite), Grice (1970, on tantalum minerals), and Rinaldi (1970, on Li-Rb-Cs micas) were completed at the University of Manitoba's Department of Earth Sciences (Mineralogy) under R B Ferguson, A.C Turnock, and P Černý These studies have been continued, and following a review of pegmatites in southeast Manitoba (Černý and Turnock, 1971), a continuing series of studies has been published in the Canadian Mineralogist Titles are listed in Table 5

Details of the mineralogical, geochemical and petrological research carried out on the Tanco pegmatite are summarized by Černý (1982) For purposes of the present report, a summary of the internal zoned structure is extracted from that report

Černý (1982) noted that "The Tanco pegmatite is a member of the Bernic Lake pegmatite group" and is "located in a subhorizontal position within a subvertically foliated metagabbro The emplacement of the pegmatite appears to have been controlled by (subhorizontal) joints and fractures ... The Tanco pegmatite is best described as a bi-lobate,

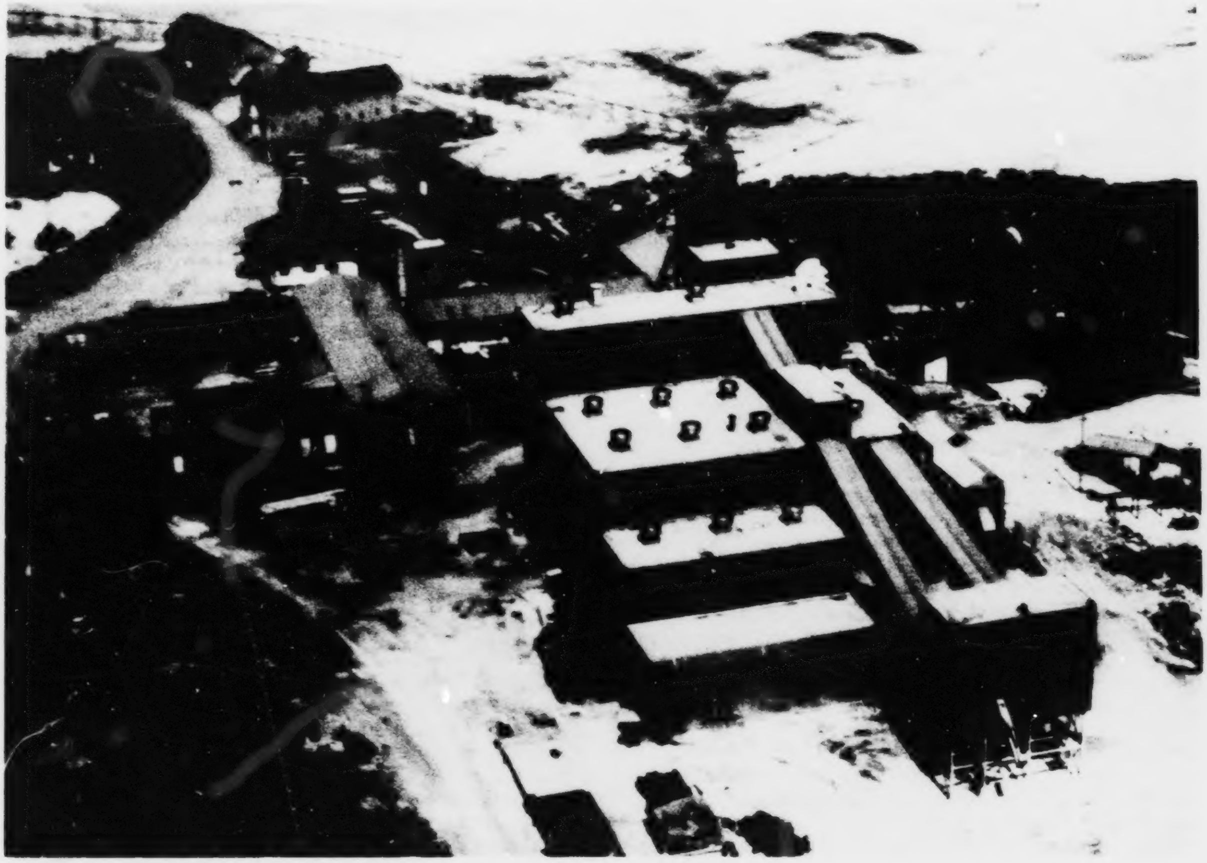


Figure 40: *Tanco minesite and tailings pit, Bernic Lake, in 1973.*

Table 5. Recent mineralogical studies of the Tanco pegmatite

The Tanco Pegmatite at Bernic Lake,Manitoba

1972	I	Geology and paragenesis; R.A. Crouse and P. Černý; Canadian Mineralogist, vol. 11, p. 491-608.
1972	II	Wodginite, tantalite, pseudo-ixiolite and related minerals; J.D. Grice, P. Černý and R.B. Ferguson, op. cit. p. 609-642
1972	III	Amblygonite-montebrasite; I. Černá, P. Černý and R.B. Ferguson; op. cit., p. 643-659
1972	IV	Petalite and spodumene relations; P. Černý and R.B. Ferguson; op. cit., p. 660-678
1972	V	Coloured potassium feldspars; P. Černý and J. Macek, op. cit., p. 679-689
1972	VI	Lithium-rubidium-cesium micas; R. Rinaldi, P. Černý, and R.B. Ferguson; op. cit., p. 690-707
1972	VII	Eucryptite; P. Černý; op. cit., p. 708-713.
1972	VIII	Secondary minerals from spodumene-rich zone; P. Černý, op. cit., p. 714-726.
1977	IX	Beryl; P. Černý and F.M. Simpson; Canadian Mineralogist, vol. 15, p. 489-499.
1978	X	Pollucite; P. Černý and F.M. Simpson; Canadian Mineralogist, vol. 16, p. 325-332
1978	XI	Native elements, alloys, sulfides and sulfosalts; P. Černý and D.C. Harris, op. cit., p. 625-640.
1980	XII	Hafnian zircon; P. Černý and J. Siivola; Canadian Mineralogist, vol. 18, p. 313-321.

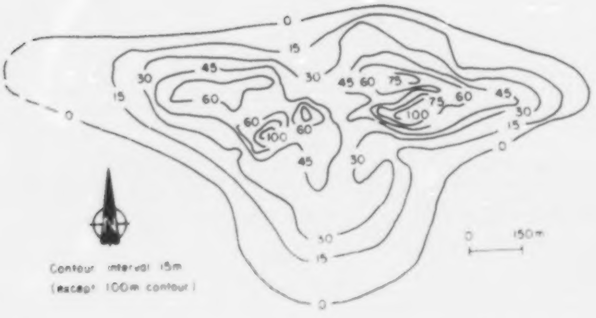


Figure 41 *Isopach plan of Tanco pegmatite (from Trueman, 1978, and Černý, 1982)*

shallowly north-dipping and doubly (E and W) plunging body." It fringes out in swarms of parallel dykes near its margins and other parallel pegmatites accompany it, particularly one below it (K.J. Olson & P. Černý, 1982) that has been extensively drilled and is known to host pollucite and Ta-Nb mineralization, as well as spodumene, beryl and cassiterite.

The main Tanco pegmatite is slightly more than 100 m thick, and has been traced E-W for 1440 m, and N-S for 820 m (Figs. 41, 42). Černý (1982) describes the internal structure as follows:

"Nine units of different mineral composition, texture and location can be distinguished within the pegmatite, and a halo of contact exomorphism in the gabbroic wall rock. Their compositional and textural characteristics as well as their economic significance are summarized [in Table 6], and [Figure 42] shows their relations in space.

"Units (1) and (2) compose shell-like concentric envelopes, commonly much thicker along the footwall contact. Units (4) and (5), whose mutual boundaries are gradational, can also be considered shell-shaped when taken as a single unit. In contrast, units (3), (6), (7), (8) and (9) occur as more or less discontinuous layers. Most of these flat lenticular bodies are confined to the upper central parts of the pegmatite.

"In a longitudinal E-W section, the pegmatite displays a distinct symmetry. At the crest of the pegmatite near its centre, most of its thickness is occupied by the Li-rich units (4) and (5). These two are separated in both flanks by the intervening unit (6), overlain by quartz and pollucite bodies (7) and (8). Most of the segments of the lepidolite unit (9) occur within and just above the two segments of unit (6), replacing it extensively. Unit (3) follows the contacts of quartz core (7) with adjacent units, and it penetrates particularly the units (2) and (6).

"Among the nine units described above and in Table 1, six zones of largely primary crystallization (2,4,5,6,7,8) and three replacement units which are metasomatic in their entirety (1,3,9) can be distinguished. This classification is, however, somewhat oversimplified. Recent studies have revealed complex arrays of mineral assemblages indicative of partial metasomatism even within the six primary zones.

"The border unit (1) is a saccharoidal metasomatic assemblage penetrating along the pegmatite/wallrock contacts and replacing zone (2). Due to its negligible thickness which varies from a few to about 30 cm, unit (1) is not shown in [Figure 42].

"The wall zone (2) is the outermost zone of primary crystallization, reaching a thickness of 35 m along the footwall contact. Giant columnar microcline-perthite (up to 3 m) in a matrix of quartz, medium-grained albite and tabular greenish muscovite (up to 10 cm) appear to be its primary constituents. Three other textural varieties of albite, columnar curvilamellar lithian muscovite and the accessory minerals probably resulted from a later replacement.

"The albitization unit (3) forms sheet-like layers up to 16 m thick as well as smaller, discontinuous and ragged lens-like bodies in the eastern flank of the pegmatite, where they penetrate along the contacts of the wall zone (2) with the overlying zones (6) and (7), or in a diffuse manner into the zone (6). In the western part of the pegmatite, this albitization is dispersed as networks of metasomatic fronts and a breccia-cementing plus corroding matrix within the zone (6) and its contacts with zone (2) and (4). This albitization is mostly saccharoidal and only rarely medium grained in texture, following after an advanced halo of muscovitization, and it is the only replacement unit carrying significant Ta, Nb mineralization along with Be, Sn, Ti, Zr and Hf.

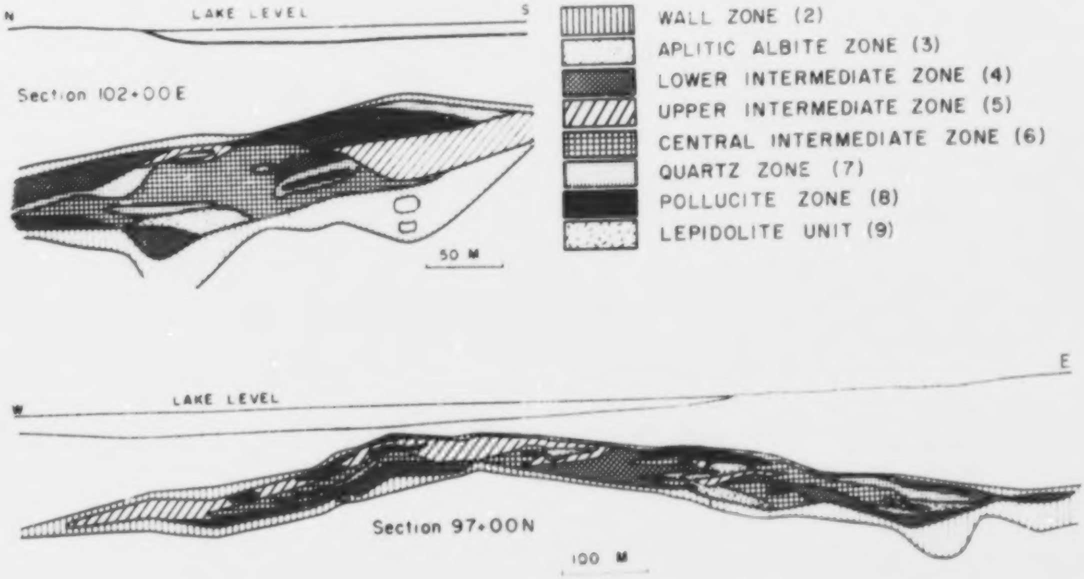


Figure 42: *Cross-sections of Tanco pegmatite (from Crouse et al., 1979, and Černý, 1982).*

Table 6. Zoning of the Tanco pegmatite (from Černý, 1982)

Zone	Main constituents	Characteristic subordinate, (accessory) and ((rare)) minerals	Textural and structural characteristics	Geochemically important major and (minor) elements	
Exomorphic unit	biotite, tourmaline, holmquistite	(arsenopyrite)	fine-grained reaction rims and diffuse veins	K, Li, B	(P, F)
(1) border unit	albite, quartz	tourmaline, apatite, (biotite) ((beryl, triphylite))	fine-grained saccharoidal replacement of zone (2)	Na	(B, P, Be, Li)
(2) wall zone	albite, quartz, muscovite, Li-muscovite, microcline-perthite	*beryl**, (tourmaline)	medium-grained, with giant K-feldspar crystals	K, Na	(Li, Be, F)
(3) saccharoidal albite unit	*albite*, quartz (muscovite)	muscovite, *Ta-oxide minerals*, *beryl* (apatite, tourmaline, cassiterite) ((ilmenite, zircon-hafnon, sulfides))	fine-grained; fracture fillings, rounded blebs, diffuse veins and undulating layers replacing zones (2) and (6)	Na	(Be, Ta, Sn, Zr, Hf, Ti, Li)
(4) lower intermediate zone	microcline-perthite, albite, quartz, spodumene, amblygonite	Li-muscovite, lithiophilite ((lepidolite, petalite, Ta-oxide minerals))	medium-to coarse-grained, inhomogeneous	K, Na, Li, P, F	
(5) upper intermediate zone	*spodumene*, *quartz*, *amblygonite*	pollucite, lithiophilite, microcline-perthite, (albite, Li-muscovite), ((petalite, eucryptite, Ta-oxide minerals))	giant crystal size of major and subordinate minerals	Li, P, F	(K, Na, Cs, Ta)
(6) central intermediate zone	*microcline-perthite*, quartz, ((albite))	(lithiophilite, apatite, spodumene)	medium-to coarse-grained	K	
(7) quartz zone	*quartz*	((spodumene, amblygonite))	monomineralic	Si	(Li)
(8) pollucite zone	*pollucite*	quartz, spodumene ((petalite, muscovite, lepidolite, albite, microcline, apatite))	almost monomineralic	Cs	(Li)
(9) lepidolite unit	*Li-muscovite*, *lepidolite*, microcline-perthite	albite, quartz, *beryl*, (*Ta-oxide minerals*, cassiterite), ((zircon-hafnon))	fine-grained metasomatic unit replacing zone (6)	Li, K, Rb	(Na, Be, Ta, Sn, Zr, Hf, Ga)

*Minerals in italics occur in economic quantities in the zones indicated

"Lower intermediate zone (4) is located mainly in the lower central parts of the pegmatite, attaining a maximum thickness of about 25 m. A lack of textural and compositional uniformity appears to be characteristic: large crystals of microcline-perthite and spodumene + quartz pseudomorphs after petalite (up to 2 m) embedded in medium grained quartz, albite and micas form one characteristic assemblage; the other one consists of quartz pods (0.5-2 m) with amblygonite-montebrasite and spodumene + quartz aggregates. Radial rims of cleavelandite and micas around the feldspar-rich assemblages usually separate them from the quartz accumulations.

"Upper intermediate zone (5) evolves gradually from zone (4) mainly upwards, by disappearance of albite and micas. Its thickness reaches locally 24 m. It is characterized by gigantic crystal size of most of its components (amblygonite to 2 m, microcline-perthite to 4 m, petalite to 13 m in length).

"Central intermediate zone (6) occupies a large portion of the central part of the pegmatite, roughly inside the shell of the combined zones (4) and (5). It attains a maximum thickness of 45 m, and its shape approximates the contours of the whole pegmatite. Its contacts with the neighbouring units are usually sharp. Microcline-perthite and quartz (5-40 cm in size) were originally the sole constituents of this primary zone, which was later penetrated by metasomatic assemblages of units (3) and (9).

"Quartz zone (7) forms a true quartz core in most of the eastern part of the pegmatite but it is segmented and placed asymmetrically, predominantly upwards, in the other parts.

"Pollucite zone (8) consists of several lenticular bodies located mainly along the upper contacts of zone (5) with the hangingwall parts of the wall zone (2). The largest of them is the only one in the eastern part of the pegmatite, 180 x 75 x 12 m in dimension.

"Lepidolite unit (9) forms two flat-lying, E-W elongated sheets up to 18 m thick, and several smaller bodies within the central intermediate zone (6) or along its contacts with the spodumene-(petalite-)rich zones (4) and (5). Fine grained (0.X-2 mm) lithian muscovite predominates over true lepidolite, both penetrating and ultimately completely replacing the microcline-perthite and quartz of zone (6).

"Late hydrothermal processes are not extensive in the Tanco pegmatite. They affect mainly the zones (4) and (5), attacking spodumene and amblygonite: cookeite, apatite, adularia, albite, cesian analcime, montmorillonite-illite, montebrasite, lithiophosphate, tancoite and other secondary phosphates, calcite and rhodochrosite are the main alteration products (Černý, 1972b). The pollucite zone (8) also suffers from a late fluid action which generates a much more prosaic, and mainly microscopic, assemblage of spodumene, feldspars, micas and clay minerals (Černý and Simpson, 1978)". (Černý, 1982).

Photographs of pollucite, amblygonite, saccharoidal albite and wodginite are shown in Figures 43, 44, 45 and 46, respectively.

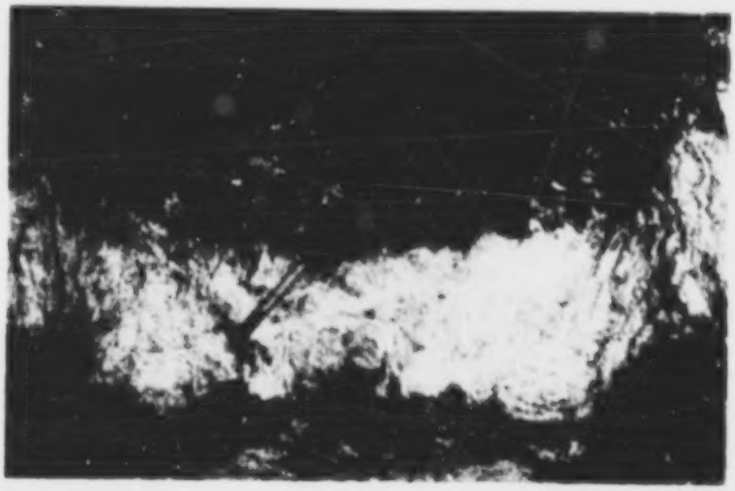


Figure 43: *North face of pollucite sub-drift, showing amphibolite, wall zone, quartz pod, and pollucite unit at base; hammer is 34 cm long.*

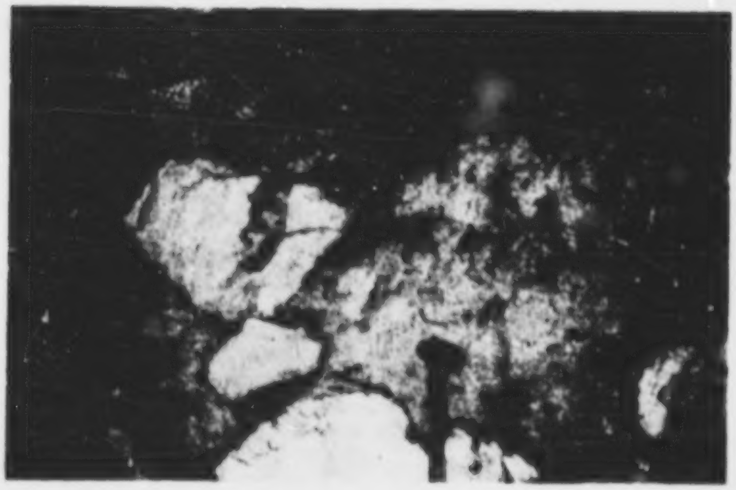


Figure 44: *Milky amblygonite in quartz, Tanco mine, hammer is 34 cm long.*

Figure 45 *Banded saccharoidal albite, Tanco mine, in back of west drift; width is about 1 m.*

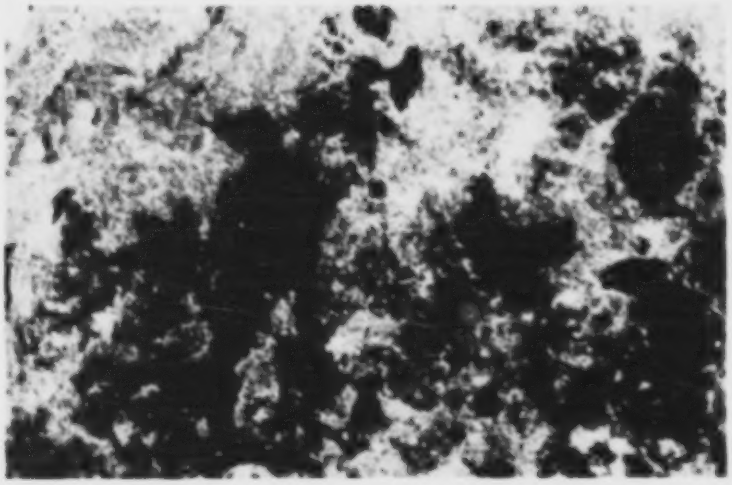


Figure 46 *Axe-shaped wodginite crystals, albitized central intermediate zone, Tanco mine.*

Burt et al. (1982) report that of the approximately 75 mineral species in the Tanco pegmatite, "seven minerals are tantaliferous: wodginite, varieties of microlite, ordered and disordered tantalite, tapiolite, simpsonite, and stibiotantalite. Economic concentrations of these species are extracted mainly from two units, the albitized central intermediate zone [zone 6] and the saccharoidal albitic unit [zone 3]. Tantalite minerals are also occasionally extracted from the lepidolite metasomatic unit." The original mill design was based on test work at CANMET (Raicevic, 1968), and details of the ore processing are reported by Williams et al. (1978) and Burt et al. (1982).

Aside from the minerals produced to date (Table 1), the Tanco pegmatite has potential for other important minerals and metals, and these are reviewed by Trueman and Burt (1983), from which the following is extracted.

Tantalite concentrates, with mill recovery of 73%, grading between 35 and 40% Ta_2O_5, were produced until the suspension of production in 1982. Potential products would include a 30% Ta slag, or Ta metal; also, the concentrates contain 10 to 20% Sn, and Tanco has developed a pyrometallurgical-hydrometallurgical process that would be capable of recovering about 50 tonnes of tin annually.

The vast spodumene resources of the Tanco pegmatite are suitable for production of high-grade ceramic quality spodumene and, using lower grade material, as a feed for a plant to produce lithium carbonate and derivative chemicals.

Gallium occurs in micas in the tailings and also in the lepidolite zone in concentrations of the order of 500 ppm. A gallium-extraction process could probably be developed.

Pollucite has been sold in small amounts to supply markets for cesium since 1960. The reserves of 320 000 tonnes grading 23.3% Cs_2O are readily accessible if required.

Beryl is a potential product, but a suitable flotation process would be required to recover beryl. Other potential products include feldspar for dental spar, amblygonite as a ceramic glaze and feldspathic sand from reprocessed tailings for bottle glass. Rubidium-rich lepidolite, containing about 3% Rb_2O, will have to await development of markets as current world consumption is less than 5 tonnes annually.

Abundant quartz is present in essentially monomineral concentrations in the Tanco pegmatite, and reserves are estimated at 700 000 tonnes. Small amounts have been used for decorative aggregate, but other uses could be developed for the quartz (Trueman and Burt, 1983).

PEGMATITES AT THE EASTERN END OF BERNIC LAKE

The property at the eastern end of Bernic Lake consists of the Buck, Coe and Pegli claims, held by Lithium Corporation of Canada Limited. Ten Li-bearing pegmatites are known to outcrop in an east-west zone, 180 m wide and 900 m long, across the south-central part of the property (Fig. 47).

In 1926, the Buck and Coe claims were staked by K. Miller and the Brilliant claim (now Pegli 2) was staked by P. Osis. The pegmatite dykes were examined by stripping, small open cuts, and trenching (Wright, 1932). In 1931, Consolidated Tin Mining Company Limited removed 181.4 tonnes of lithium minerals by the open-cut method, primarily from Pegmatite No. 3 on the Buck claim. In 1934, the property was acquired by Lithium Corporation of Canada Limited, and 11 holes were drilled totalling 194.2 m. Between 1940 and 1942, a total of 1186 tonnes of pegmatite was quarried from the Buck pegmatite No. 3, and was hand-sorted into bins containing 9.5 tonnes of quartz-spodumene, 22.6 tonnes of amblygonite, 31.7 tonnes of 80% amblygonite, 27.2 tonnes of triphylite, and a few tonnes of tourmaline; 29 tonnes of amblygonite were sold (MRD files).

The property was drilled extensively in 1956, and two subsurface pegmatites were outlined in 45 holes totalling 4500 m. An upper pegmatite layer, dipping at a low angle (about 7°) to the west, is probably the western extension of pegmatites 3 and 10. The lower, main pegmatite, probably the extension to the west of pegmatites 5 and 6, has been estimated to contain 725 750 tonnes of ore grading 2.13% Li_2O; the pegmatite dips westward at an average 7° across the property, below the zone of the other surface pegmatites. In 1970, pegmatite 7 on the Coe claim, which contains a concentration of petalite, was drilled to a shallow depth.

Steeply dipping rocks of the Rice Lake Group outcrop over the entire claim group. The majority of the rocks are fine grained black to greenish amphibolites; massive, schistose, recrystallized and granitized varieties are present, as well as poorly preserved pillow lavas. Along the northern shore of Bernic Lake, west of the property, cliffs of metavolcanics show pronounced joint planes dipping 7° to 10° west (Fig. 48). It is believed that the major pegmatites on the Buck-Coe-Pegli group have been intruded along similar crosscutting tension fractures at depth.

Pegmatite 1

The pegmatite is poorly exposed 305 m east of Bernic Lake (Fig. 47) over an area 1.5 by 1.5 m on the eastern slope of a rock ridge on the trail along the northern side of the swamp that bisects the property. The contacts of the pegmatite are covered, and it has not been trenched. It consists mainly of coarse grained microcline with minor amounts of interstitial quartz and muscovite. A 2.5 x 5 cm mass of purpurite is associated with muscovite and occurs close to a 20 cm mass of quartz.

Pegmatite 2

A thickness of 1.5 m of pegmatite is exposed for 12 m along the northern edge of the central swamp on the Buck claim, about 80 m west of the open cut in Pegmatite 3. A probable continuation of the dyke outcrops 26 m to the northeast; its contact strikes 255° and dips 25° north. Below a tourmaline-bearing border zone, the pegmatite consists of medium- to coarse-grained quartz and albite, with tourmaline crystals up to 2.5 x 5 cm. At the swamp level, a possible quartz core is visible. An area 30 cm square of spodumene was exposed in a trench (McCartney, 1930), which was below swamp level in 1973. A few small patches of purpurite occur in the feldspar; minor glassy blue apatite is present.

Pegmatite 3, Main workings, Buck claim

The major surface pegmatite is present in the eastern central part of the Buck claim. It has well defined zoning that can be studied easily along the walls of a bi-level open cut, 24 m long and 6 to 7.5 m wide (Fig. 49). The pegmatite is exposed also in two small pits 20 m and 30 m north of the open cut.

The pegmatite contains abundant tourmaline, spodumene, amblygonite and triphylite, as well as apatite, lepidolite, and minor beryl. Rare tantalite, pollucite alteration products, and cassiterite are reported (Lenton, 1979; Černý, 1978; and Černý et al., 1981, respectively).

The pegmatite has the shape of an inverted saucer. The highest point is at the north end of the open cut, where the upper contact is horizontal. If the strike is taken as 360°, the dyke plunges 15° south and dips 25° to 30° east at the south end. The dip to the west is not directly measurable, but exposures in a small pit 15 m west of the open cut suggest the dyke, in the open cut area, flattens out and thins to the

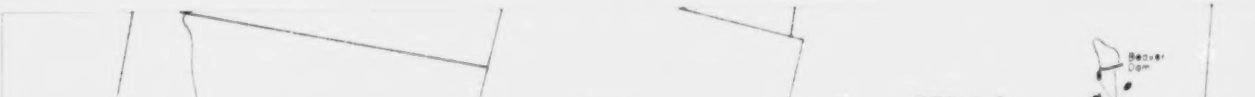


Figure 47. Location of Buck, Coe and Pegli pegmatites, east end of Bernic Lake.

Figure 48 *West-dipping fracture planes in steeply dipping amphibolites, north shore of Bernic Lake near eastern end.*

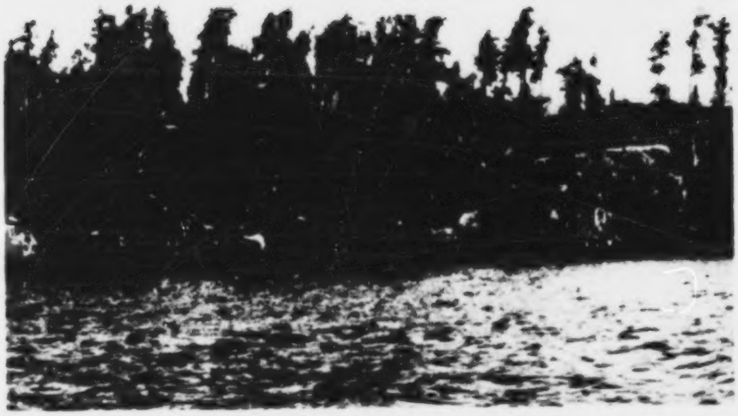


Table 7. Mineralogy of zones in Pegmatite 3 Buck claim

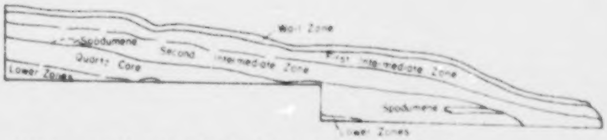
Border zone 6 to 12 mm	Fine grained albite (95%) in crystals perpendicular to the contact, mixed with quartz, with small black tourmaline crystals. Lenton (1979) reported rare, corroded, 0.5 mm crystals of garnet.
Wall zone 20 to 35 cm	Black tourmaline crystals (75 to 80%) oriented perpendicular to the contact, up to 15 cm across, some hard, shiny black crystals. Quartz (10%), albite (10%), muscovite (most abundant near base of zone). Rare beryl around tips of tourmaline (Lenton, 1979).
First intermediate zone (variable composition) to 121 cm	Quartz (45%), albite (15%), pegmatite with muscovite flakes (25%), minor spodumene (5%), greenish white, intergrown with quartz, at north end of open cut. Pink microcline, at base, very coarse, quartz + muscovite stringers along cleavages. Cleavelandite, abundant. Beryl, a few small pale green to white crystals, particularly in upper part of north wall, to 25 mm across; also as anhedra 18 mm across. Amblygonite crystals to 13 cm across, and books of muscovite to 7 cm thick. Apatite, blue crystals to 1.2 cm; a few small red garnets.
Second intermediate zone (rough, sheared appearance in places) to 76 cm	Spodumene-quartz intergrowths (10%). Amblygonite (10%) to 15 cm across with large masses of quartz and feldspar; at south end, amblygonite masses to 61 cm across. Quartz (60%); one mass of quartz 2 m thick exposed in southwest corner of open pit, overlying the quartz + triphylite zone. Cleavelandite (20%), pinkish white masses. Li-muscovite, small amount scattered through cleavelandite, at south end. Minor tantalite (Lenton, 1979).
Core zone to 200 cm	Quartz (70%) predominant. Amblygonite (10%) in large white crystals up to 30 cm wide, 60 cm long, embedded in quartz. Triphylite (5%), resinous green, in the upper level in large masses to 90 x 60 x 30 cm. Spodumene, pale green, primary (Lenton, 1979). Cleavelandite (15%) in large crystals, at south end. Apatite, small glassy blue crystals in quartz, also as massive veins in quartz and drusy crusts in fractures (Lenton, 1979).
Lower zones	The intermediate zones, and a thin wall zone somewhat similar to the above, occur below the quartz core, and are exposed along parts of the west wall of the open cut. In one place, masses of amblygonite occur in pink cleavelandite (Gass, 1957, and Lenton, 1979). Large quartz-spodumene intergrowths are pseudomorphs of petalite (Fig. 51).

Note: A more detailed description of the mineralogy of the zones in the Buck pegmatite is given by Lenton (1979, Table 4-1), who considers the core zone to contain parts of the intermediate zones listed above.

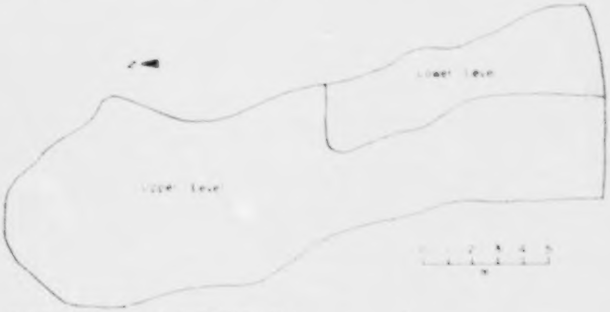
west. Maximum thickness is along the eastern side of the open cut, where 6.7 m of pegmatite is indicated by drilling. The wall rock is amphibolite, striking 90° and dipping vertically.

The zonal structure and mineralogy is illustrated in Figure 49 and listed in Table 7.

The dyke has been studied in detail by Lenton (1979). He noted minor holmquistite in the wall rock, some 10 m from the contact, and minor tantalite (Fig. 50) in the pegmatite. Pockets of green clay composed of kaolinite, illite, and montmorillonite are interpreted to be low temperature alteration products of primary pollucite (Černý, 1978 and Lenton, 1979). A detailed description of the mineralogy, zoning, and petrogenesis of the Buck pegmatite is included in Lenton (1979).


Wall Zone
Spodumene
Second
Intermediate Zone
First Intermediate Zone
Quartz Core
Lower Zones
Spodumene
Lower Zones

a) Section exposed along east wall of Buck open-cut (see Table 7)


N
Lower Level
Upper Level
0 1 2 3 4 5
m

b) Plan of open cut in Buck pegmatite (No 3)

Figure 49 Plan and section of Buck (No 3) pegmatite

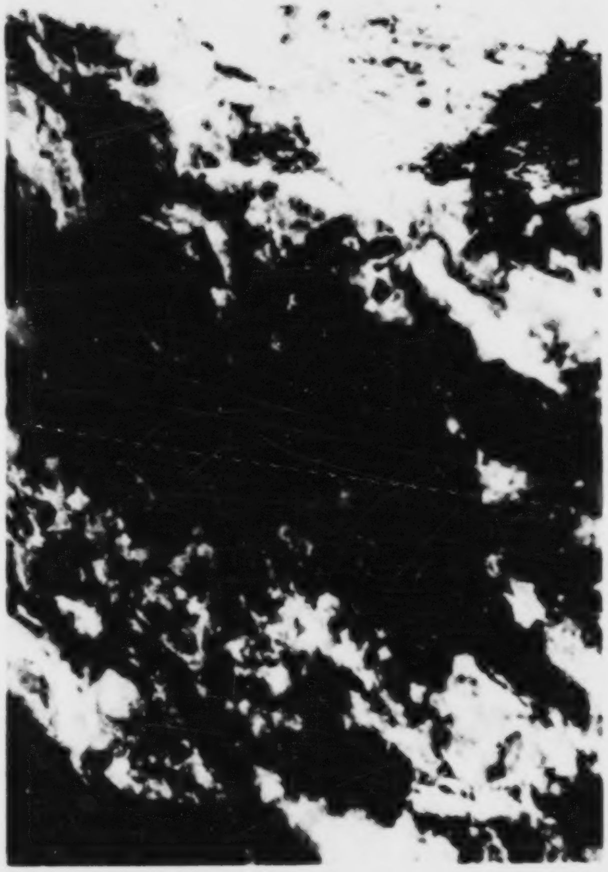


Figure 50 Tantalite crystal aggregate, 5 cm across, Buck (No 3) pegmatite

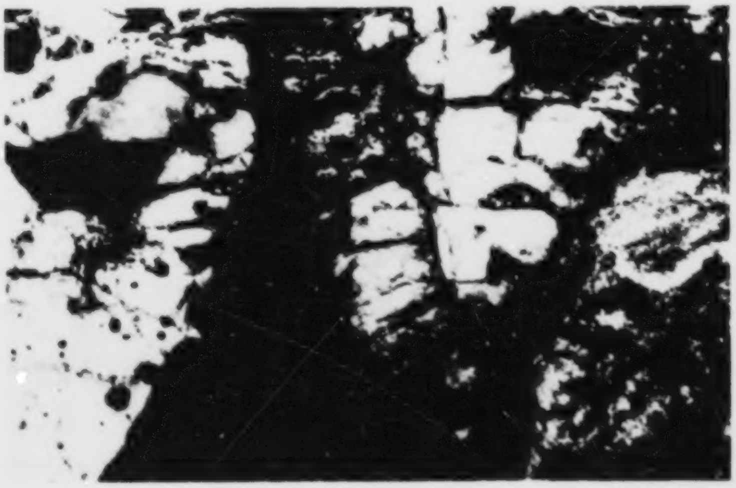


Figure 51 Spodumene + quartz pseudomorph of petalite, between masses of milky white amblygonite, west wall of Buck open pit

Pegmatite 4

An irregularly-shaped, generally thin and flat-lying pegmatite outcrops along the edges of and on the top of a low rounded outcrop, otherwise composed of fine grained amphibolite. It is located about 6 m west of the number 3 post of the Pegli 2 claim, on the Buck claim.

The larger of the two pegmatites that are exposed has a north-south length of 9 m, and widens in an irregular manner from 1.5 m at the south end to 4.3 at the north end. The maximum thickness exposed is less than 30 cm, and this appears to be close to its total thickness. The pegmatite consists of fine- to medium-grained sodic plagioclase that has a red weathered surface, intergrown with quartz. Numerous small shiny black crystals of cassiterite are scattered through the feldspar. Some patches of coarser grained pegmatite are present.

A second dyke, which is probably an off-shoot of the main dyke, is exposed in the western part of the outcrop. This dyke contains both black tourmaline and black cassiterite crystals.

Accessory minerals include glassy blue apatite and purpurite(?)-triphylite along the contact between the fine grained and medium grained phases. A minute shiny black radioactive crystal of uraninite(?), surrounded by a bright yellow oxidized halo, was noted.

Pegmatites 5 and 6 (Pegli 2)

An outcrop area east of the Buck open pit consists of amphibolite with zones of silicified metavolcanics and interbedded laminated tuff and greywacke. It rises to the east and terminates in a 12 m cliff face 475 m east of the open pit. Two flat-lying, parallel pegmatites outcrop along part of the east-facing cliff on the Pegli 2 claim.

Pegmatite 5, the upper layer, is a long, thin, nearly horizontal pegmatite exposed for a length of 64 m, 6 m above the swamp level. It has an average thickness of 1.5 m. The central part of the dyke is coarse quartz + pink perthite + pale yellow lithian muscovite, with minor beryl and amblygonite. About 24 m north of the south end, a small pit exposes pale green spodumene + quartz intergrowths that make up 25 per cent of the dyke over a small area. The intergrowths are pseudomorphs of petalite. White cleavelandite is present, and triphylite, altered phosphates, and green tourmaline are present.

The second dyke, Pegmatite 6, outcrops 6 m below the northern part of Pegmatite 5, at the base of the cliff. A small pit, 1.8 m deep, has been blasted into the pegmatite. The dyke is flat-lying. It has a medium grained quartz-feldspar border zone, with small black striated tourmaline crystals. Below this zone, the exposed part consists of coarse quartz, pink K-feldspar, books of pale yellow lithian muscovite and a small amount of amblygonite. In the southern outcrop, 7.5 m south of the pit, the pegmatite consists of large masses of pink K-feldspar with some lepidolite and amblygonite. The dyke dips at a low angle into the cliff; the base is not exposed. It has a larger content of tourmaline than the upper dyke.

Other small pegmatite outcrops are present 30 m to the northeast of the pit, on the east side of the creek, and also north of the pit, immediately southwest of a pond on the beaver-dammed creek. The exposure east of the creek is an apparent updip extension of pegmatite 6. Abundant tourmaline is present, along with quartz and feldspar.

Pegmatites 5 and 6 are probably an outcrop of the main lithium pegmatite that was outlined in the 1956 drill program; it dips at a persistent 7° angle to the west, occurring at a depth of 70 m below the Buck open cut.

Pegmatite 7 (Coe)

An unusual pegmatite, containing concentrations of large crystals of petalite, outcrops on the Coe claim, 120 m west of north from the number 3 post of the Buck claim. The dyke is irregular in shape and is intruded into amphibolite. At least six quartz + white cleavelandite + tourmaline stringers, ranging from 12 mm to 30 cm wide, cut the wall rock southwest of the pegmatite. They strike about 295° and dip 70° south. The dyke itself is exposed over a length of 9 m. Two shallow pits have been blasted into the pegmatite.

At its southeastern end, the pegmatite is in sharp contact with amphibolite. Coarse grained petalite, in crystals up to 15 x 20 cm, is present and occurs adjacent to the contact. Elsewhere, the dyke has a border zone of fine grained quartz + albite + muscovite + tourmaline. Both black and deep blue tourmaline occur. In contact with this zone is a dense saccharoidal albite, probably metasomatic. The main part of the pegmatite at the southern end consists of masses of greyish white and white petalite, the largest of which is at least 35 x 25 x 20 cm. Greenish-yellow mica, purpurite, triphylite, amblygonite, and apatite are associated with the petalite. Spodumene-quartz intergrowths and euhedral white beryl crystals were noted in the rock pile southeast of the pit.

In the western pit, at the southern end, blocks of amphibolite are included in the pegmatite, which has a 6 mm chilled contact both around the xenoliths and in contact with the wall rock. Coarse petalite crystals are in contact with the fine grained margin.

An outcrop of pegmatite 6 m north of the southeast pit shows a quartz-rich pegmatite with a tourmaline-bearing border zone in contact with amphibolite. The contact strikes 175° and dips 45° west, increasing to vertical. Some fine grained spodumene was noted in the quartz.

A hole drilled in 1934 to the south of the pegmatite pits suggests the pegmatite dips 50° south. In 1970, 10 additional shallow drill holes intersected short sections of pegmatite.

Thin sections of the petalite zone indicate original myrmekitic quartz-albite has undergone albitization, resulting in abundant vermicular quartz in albite laths. Stress effects are common in the feldspars and muscovite; petalite occurs as well crystallized, clean crystals. Beryl and a tantalum-mineral occur as accessories.

Pegmatite 8

A narrow pegmatite, striking 265° and dipping 60° south to vertical, is exposed in two outcrops (Fig. 47) over a length of 20 m. The dyke is 1.2 m wide at the eastern end.

In the western outcrop, the northern contact is a breccia complex of amphibolite xenoliths up to 60 cm long in a matrix of fine grained grey albite + tourmaline + quartz pegmatite. In places a 6 mm chilled contact is present. In one area the xenoliths are aligned in concentric curved bands (Fig. 32). The next 60 cm zone consists of pink and white albite, in part saccharoidal and in part in radiating clusters, with coarse yellowish muscovite flakes. South of that is a narrow zone of massive quartz, only several centimetres wide, followed by a 7 to 12 cm greisen-like zone of coarse quartz and muscovite. That is followed by a 6 mm fine grained contact zone of white albite + quartz + tourmaline. At the western end of this outcrop area, several crystals of white beryl, 7 to 15 cm across, are concentrated.

In the outcrop 9.1 m to the east, the pegmatite contains a 60 cm quartz core. Beryl crystals occur between the quartz core and a pinkish to white albite-muscovite zone. One large cluster comprises several beryl crystals, each 7 to 10 cm across. Pseudo-ixiolite, as well as cassiterite, were identified by X-ray methods.

Six metres north of the dyke, two narrow pegmatite stringers, 15 and 5 cm wide, contain some lithian muscovite, small black cassiterite crystals, and blue apatite grains.

Pegmatite 9, Buck claim

A zoned pegmatite outcrops along the southeastern edge of a cliff for a length of 33 m, in the southwestern part of the Buck claim. The dyke plunges 15° to the northeast and dips 25° northwest. At the southwestern end, the exposed width is 7.5 m. The exposed thickness or height is only 2.4 m, as the bottom contact is below swamp level. A 1934 drill hole intersected 2.1 m of pegmatite 15 m northwest of the cliff.

An upper chilled border zone consists of 12 to 25 mm of small black tourmaline grains in a quartz + pink, white and grey feldspar mixture. A 20 to 25 cm wall zone consists of large black and greenish black

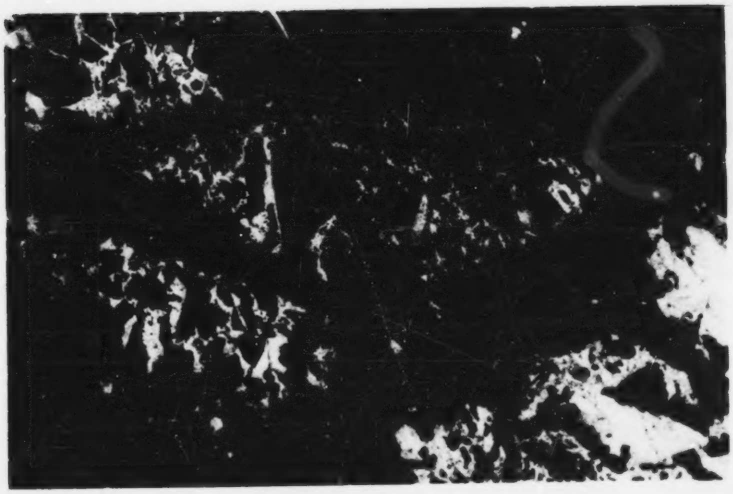


Figure 52: *Metavolcanic inclusions with pseudoconcentric orientation along margin of Pegmatite 8, Bernic Lake east.*

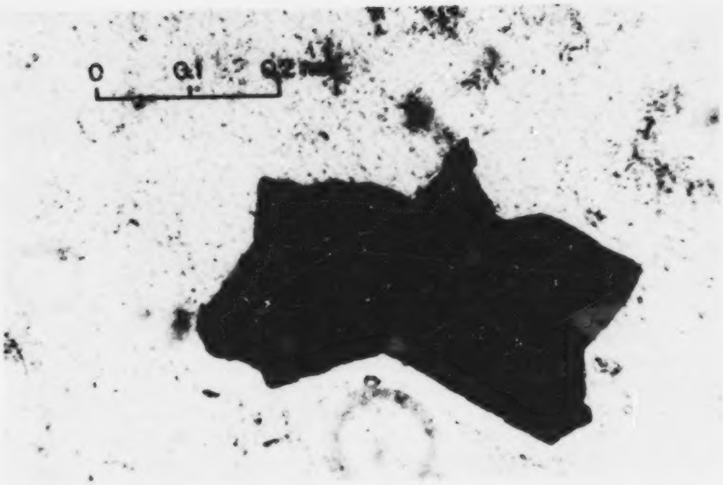


Figure 53: *Cyclic twinned crystal of cassiterite: one grain from a local concentration, in fine grained albite + quartz + muscovite; Pegmatite 10, Bernic Lake east.*

tourmaline crystals, up to 15 cm across, pale yellow lithian muscovite and quartz. Below that is a 60 cm zone of red albite + muscovite + quartz.

The remainder of the pegmatite, down to the swamp level, contains large masses of quartz, cut by bands of deep purple and brownish purpurite. Other minerals present are pinkish-white amblygonite, greenish-white and white beryl, spodumene-quartz intergrowths, coarse bladed spodumene, masses of lepidolite and glassy blue apatite grains.

The mineralogy and zoning of this dyke is similar in many respects to that of Pegmatite 3, and, as noted elsewhere, the two exposures may represent outcrops of a large pegmatite sheet that extends across the intervening swamp.

Pegmatite 10

The pegmatite outcrops along the edge of a cliff about 37 m north of Pegmatite 9, with a swamp to the east. The cliff face has been blasted, leaving a large mass of pegmatite separated from the main outcrop. In general, the pegmatite has a chilled border zone of pink very fine grained pegmatite containing apatite. The zone in places consists entirely of pink feldspar.

The central part is composed mainly of masses of quartz, enclosing white amblygonite. Other minerals present include spodumene, triphylite, cassiterite (Fig. 53), and milky white beryl. The dyke is exposed for a length of 10 m and strikes about 350°.

An older report stated that pegmatite is present in the swamp area 15 to 23 m east of Pegmatite 9. Three pits were blasted, and some amblygonite was recovered. Other characteristics are not known.

As reported below, the 1956 drill results indicate that a possible connection exists between Pegmatites 3 and 10. In four drill holes south and southwest of the Buck open pit, pegmatite formed the bedrock surface beneath the swamp. In eight other drill holes to the west, pegmatite was intersected at a shallow depth.

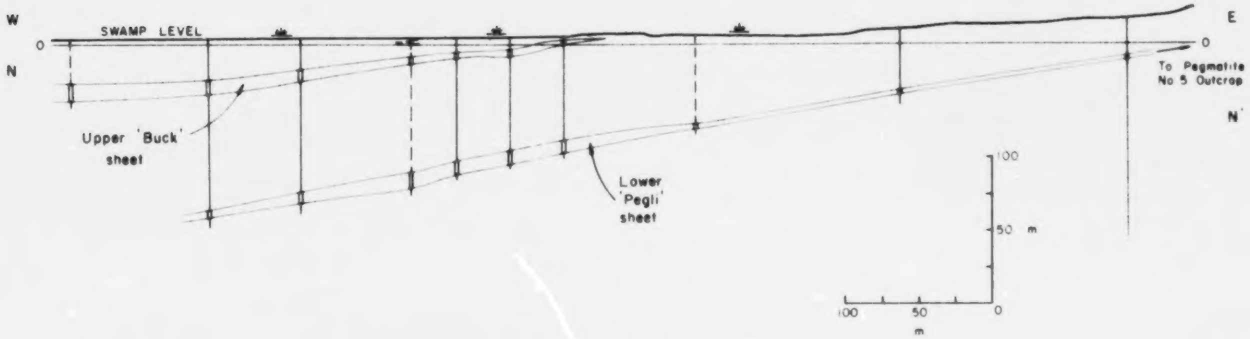


Figure 54: *Diagrammatic cross-section of two pegmatite sheets, east end of Bernic Lake*

Main subsurface pegmatites, Bernic Lake east

In 1956-57, 3000 m of drilling outlined the large Pegli pegmatite sheet that dips at a constant 7°W (Fig. 54) and extends westward for at least 900 m from its outcrop in the cliff exposures of Pegmatites 5 and 6. The pegmatite has concentrations of petalite, spodumene-quartz intergrowths, lepidolite, lithian muscovite and ambylgonite, and abundant tourmaline along its footwall contact. Thickness of the sheet ranges from 2 to 16 m, but averages about 10 m in the area of major lithium mineralization. Reported reserves in the dyke, mainly in the central part, are 725 750 tonnes grading 2.13% Li_2O.

The dyke is persistent across the Pegli and Buck claims, with a slight dip to the south off a crestal area that occurs below the Buck open cut and to the east; the crestal area is the location of a 9 m mass of almost pure, milky white petalite intersected in one drill hole.

The upper pegmatite sheet, of which Pegmatites 3, 9 and 10 are probable outcrops, extends uninterrupted beneath the swamp across the Buck claim, based on the occurrence of pegmatite at the bedrock surface below the swamp in several drill holes between the two outcrop areas.

Černý et al. (1981, Table 39) report the upper pegmatite layer was intersected in a drill hole 900 m west of the open cut; spodumene occurs in the core zone. In their Figure 130 (op. cit.) the two pegmatite sheets are projected westward for an overall distance of a surprising 3 km, to within 1.5 km of the eastern end of the Tanco pegmatite. Based on their extensive geochemical studies of fractionation levels in the pegmatites, they propose a probable hidden pegmatitic granite, located between the Tanco and East Bernic pegmatites, as a common parental intrusion.

PEGMATITES OF THE RUSH LAKE AREA

Several pegmatite dykes intrude metavolcanics of Bernic Lake Formation and metasediments of Booster Lake Formation (Fig. 55) in the area between Rush Lake and Bird Lake road, P.R. 315. The dykes contain a variety of rare-element minerals — spodumene, triphylite, cassiterite, beryl, Ta-Nb minerals and alteration products of pollucite.

Extensive exploration between 1929 and 1943 was focussed mainly on the occurrence of cassiterite, and spodumene was noted primarily in the Stannite pegmatite. The area has been mapped in detail and explored by Tanco and subsidiary companies since 1967, and the Bernic (Odd West), Odd, and other dykes have been drilled. Černý et al. (1981) note several lines of evidence that suggest the pegmatites are derived from the Osis Lake pegmatitic granite that outcrops to the east of Rush Lake. To date, economic development of the dykes has not been attempted.

Rush Group

A large pegmatite containing a comparatively small quantity of several rare-element minerals outcrops 610 m west of the west end of Rush Lake. It is on the old Rush group of claims, held in 1929 by Consolidated Tin Corporation Limited. The complex ownership history is outlined on Mineral Inventory card 52L/6 Sn 4, in Bamburak (1980).

The pegmatite outcrops over a length of 390 m, and has a maximum width of 75 m, although large inclusions of metavolcanics are present. Several trenches, at about 75 m intervals, and a few small pits have been blasted into the dyke. The pegmatite is intruded into steeply dipping amphibolite, and is apparently conformable.

At its eastern end, the dyke has the texture of pegmatitic granite; a short distance west, the pegmatite is very coarse grained, consisting mainly of microcline-perthite megacrysts. Overall, the dyke has a very

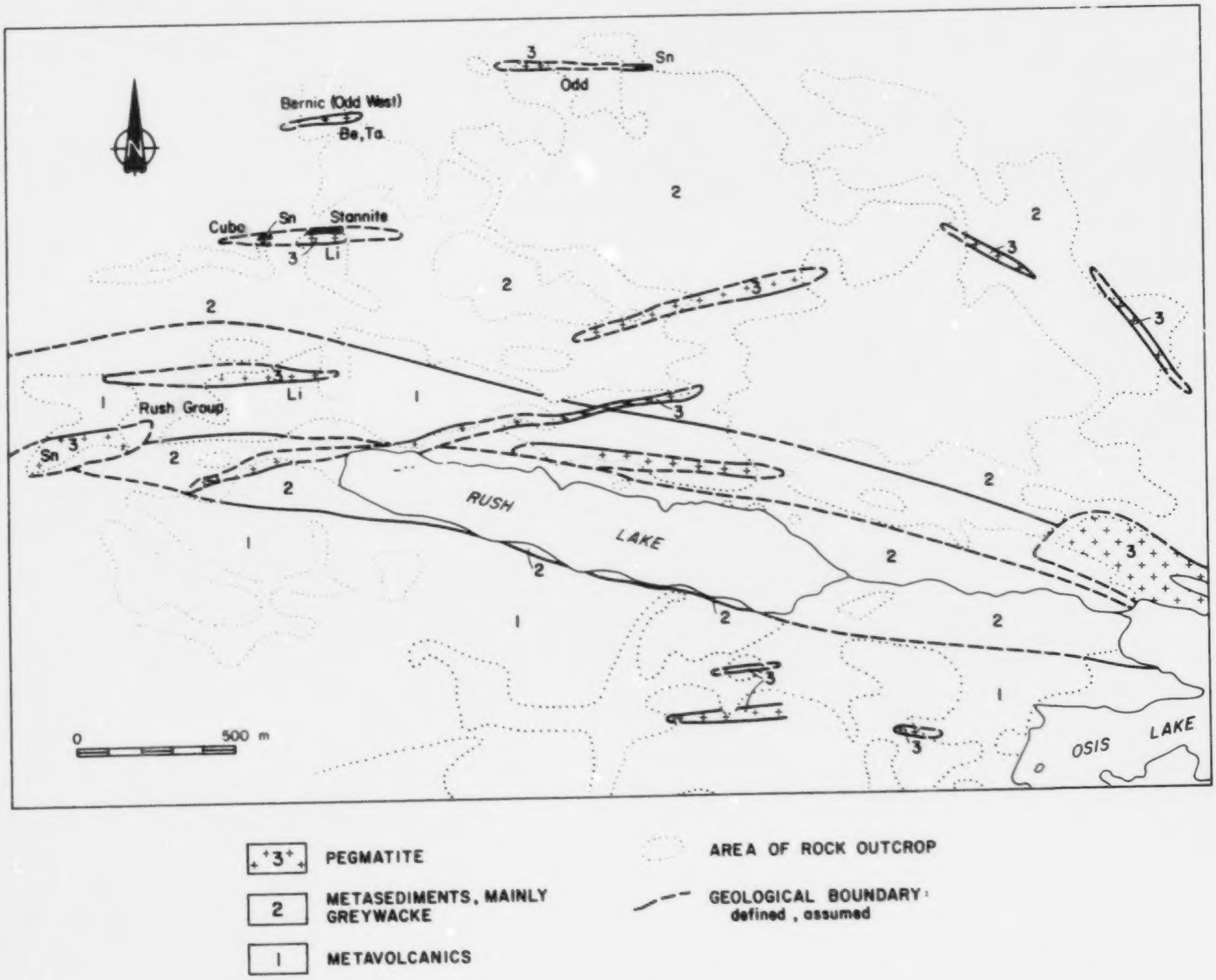

Odd
Sn
3
Bernic (Odd West)
Be,Ta
N
2
Cubo
Sn
Stannite
3
Li
2
2
2
3
3
3
3
Li
Rush Group
I
I
3
Sn
2
2
2
RUSH
LAKE
2
I
2
I
2
2
2
3
3
3
I
0
500 m
OSIS
LAKE
PEGMATITE
METASEDIMENTS, MAINLY GREYWACKE
METAVOLCANICS
AREA OF ROCK OUTCROP
GEOLOGICAL BOUNDARY: defined, assumed

Figure 55: Pegmatites near Rush Lake (geology from Davies, 1954).

high feldspar content. Near the western end of the dyke, graphic intergrowths of quartz and K-feldspar are abundant, as well as some medium grained white albite.

Masses of triphylite, up to 127 by 76 mm, are present in a medium grained phase in the central part of the dyke, and are associated with yellow mica and quartz. A small area with some sphalerite occurs near the triphylite, and small black crystals of pseudo-ixiolite occur in light pinkish perthite. Tourmaline is abundant, and tapering ends of coarse crystals are oriented downward.

Minor amounts of arsenopyrite, spodumene, amblygonite, beryl, cassiterite and garnet have been reported from the deposit, but only in minute amounts (Davies, 1955, p. 42). Spodumene and amblygonite were reported by McCartney (1930) to occur in the bottom of a pit on the northwestern side of the outcrop. Spodumene and quartz intergrowths were present over a length of 60 cm, and two amblygonite crystals about 15 cm square in a glassy quartz matrix were observed by McCartney when the trenches were fresh. Wright (1932) noted that, "only a few crystals of cassiterite were recognized in the trenches".

Pegmatite northwest of Rush Lake: RL-3

An irregularly shaped pegmatite, intruded into garnetiferous schist, outcrops 220 m at 295° from the old cabin near the west end of Rush Lake, north of the shore. The eastern end of the pegmatite consists of two outcrop areas of fine- to medium-grained pegmatite.

Near the western end of the pegmatite is a trench, striking 240°, 7.5 m long, 1.5 m wide, and over 0.9 m deep to the water level. The south contact of the dyke strikes 280°, but is variable. The dyke is mainly a pink pegmatitic granite, with abundant grey perthite and some blue tourmaline. Minerals identified in samples collected from the adjacent rock pile include: lepidolite (reported to be exposed in the bottom of the trench), spodumene, beryl, and a strongly radioactive bright yellow oxide identified by X-ray methods as autunite.

Černý et al. (1981) report rare amblygonite-montebrasite and cassiterite from this dyke.

Stannite pegmatite

The main cassiterite and spodumene pegmatite outcrop on the Stannite claim, held by K.E. Miller in 1929, is located approximately 620 m north of the west end of Rush Lake. The larger, eastern part of the dyke, is exposed on the north slope of a rock ridge over a length of 140 m. The western part is a low outcrop in which 12 m of pegmatite is exposed, separated by 45 m of swamp-covered land from the larger outcrop. The continuity of the dyke is assumed, but is not definitely established.

The pegmatite dyke intrudes metagreywacke and quartzite, strikes 280° and dips nearly vertically. It is generally concordant with the metasediments, although in places it is irregular in shape. In the eastern part, the dyke is 3.3 m wide, and zoned. The wall zone consists of 90 cm of medium grained quartz + albite + muscovite; next is a 10 to 20 cm zone of white feldspar + quartz + muscovite + tourmaline. The centre comprises a 30 cm zone of a banded aplite. Curved bands of the aplite, with the bands oriented convex-side inwards, occur along both sides and meet in the centre of this zone. The aplite consists of a fine grained quartz + white feldspar aggregate with some light brownish-red garnets. The banding is shown by a rough segregation of the quartz and feldspar into poorly defined layers, and by narrow bands of small black tourmaline crystals.

Towards the middle of the eastern outcrop, a pit has been blasted into an area less than one square metre in extent that contains coarse greyish spodumene crystals; 25 x 12 cm and 15 x 15 cm crystals were the largest noted. These are associated with quartz, plumose mica, and coarse grained pink and pink + grey perthite. This is the coarser grained part of the pegmatite. Some aplitic banding was also noted there. Fine grained spodumene and quartz intergrowths are present, along with accessory purplish and green lithian muscovite, beryl, cleavelandite, tourmaline (including rubellite) and tantalite. In one place, the fine- to medium-grained quartz and muscovite zone, with minor tourmaline, shows an interior chilled contact with a perthite megacryst. The chilled zone is 6 mm in width and very fine grained.

McCartney (1930) reported triphylite and purpurite, including a brown weathered product from this dyke. Černý et al. (1981) noted some petalite pseudomorphs and identified accessory amblygonite-montebrasite and rare cassiterite.

The western outcrop, referred to as the Cubo No. 1 pegmatite in some early reports, consists of a small ridge 12 m long, 1.2 to 2.4 m wide, rising 1.5 m above the surrounding muskeg. Metagreywacke, dipping south at 85°, is present along the north contact of the pegmatite. The main part of the outcrop consists of coarse red feldspar, in a quartz matrix, grading to fine grained quartz and feldspar and mica at the east end. Small white beryl crystals are present. The outstanding feature of this outcrop is a 90 cm^2 area (Bateman, 1943) that originally extended along the north side of the pegmatite, and consisted of a coarse quartz and muscovite intergrowth containing abundant black cassiterite crystals up to 12 mm across. The cassiterite occurs both as isolated crystals and as aggregates of crystals. Both feldspar and tourmaline are absent from this zone. The zone is thickest where it is covered by the swamp, and thins eastward. Davies (1955) reports the cassiterite-bearing zone is only 0.3 m wide, and is exposed for about one metre. The cassiterite has either been removed or is moss and lichen covered. None could be located on the outcrop during a brief examination in 1973.

The "Cubo" dyke was drilled in 1943 by God's Lake Gold Mine and was trenched to the north and south and also along strike to the west (ESS file 91448); a map shows only the location of the outcrop, trenches and two drill holes.

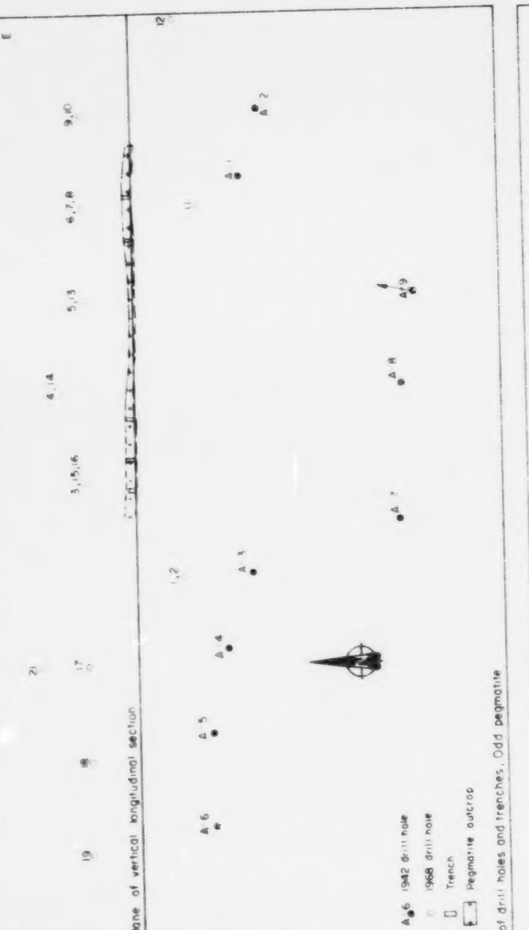
Bernic dyke (Odd West)

A pegmatite dyke 300 m north of the Stannite dyke outcrops along the top and down the side of an outcrop of metasediments. It was mapped in detail and six trenches were blasted into the dyke in 1967 for Tantalum Mining Corporation of Canada Limited. Tin-tantalum mineralization was found (ESS file 91447), and the dyke has been drilled extensively.

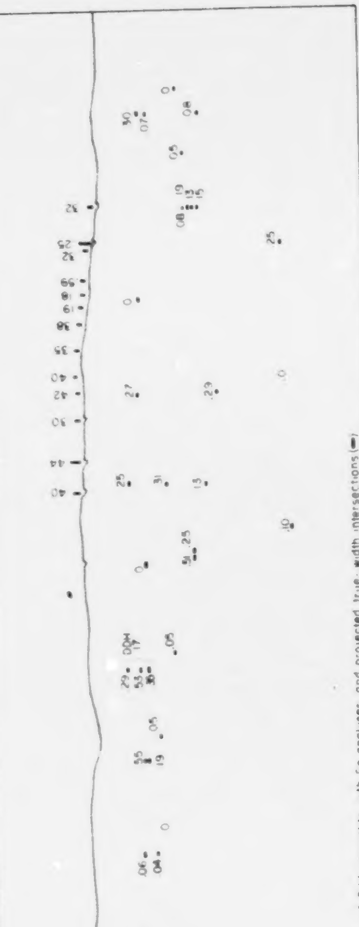
In the cliff face, the pegmatite has a complex outcrop pattern. Three segments from east to west appear to be progressively offset to the north, and the general strike of the south contact is 250°, dipping steeply north. At the west end, in the cliff face, the contact swings to 310° and then to 350°, and the metasediments appear to overlie the pegmatite. A narrower extension of the dyke outcrops to the southwest, on top of the ridge, indicating a length of about 150 m.

The dyke has a fine grained border zone 5 to 15 cm wide of quartz, albite, and red-tarnished mica. In the cliff outcrop, the interior of the dyke consists mainly of coarse grained white, grey and pink albite and microcline-perthite with large clots of reddish weathering muscovite, some greenish lithium muscovite and a notable amount of quartz. Some black and deep greenish tourmaline (verdelite), which occurs in radiating clusters to 10 cm across along shear planes, is an abundant accessory, along with blue apatite grains. Aplitic patches contain small grains of cassiterite (two X-ray powder identifications) and a sulphide mineral.

Černý and Harris (1973a, b) report the presence of rare minerals in this dyke, which they called the "Odd West pegmatite". Allemontite (AsSb) and its alteration products occur "in lenticular aggregates up to 10 x 15 x 25 mm, located along the contacts of montebrasite and dark grey quartz in the central parts of the pegmatite". They reported "subordinate amounts of montebrasite and spodumene, and minor Li-mica" also from the central blocky microcline-perthite part of the dyke. In addition, cassiterite, tapiolite, stibiotantalite, and antimonian microlite occur as rare grains in a coarse grained albite + quartz + muscovite matrix "in a zone intermediate between the hanging wall margins and the core".


W
E
Plane of vertical longitudinal section
1942 drill hole
1968 drill hole
Trench
Pegmatite outcrop

A) Plan of drill holes and trenches, Odd pegmatite



B) Longitudinal section of Odd pegmatite, with Sn analyses, and projected true-width intersections

Figure 56: Odd dyke, plan of drill holes and section showing Sn analyses.

Six samples from the dyke were assayed for Sn, BeO, Nb_2O_5 and Ta_2O_5 by X-ray Assay Laboratories in 1962 for A.C.A. Howe and Associates Ltd. The analyses (GDS file 91447) show:

Sn = 0.01 to 0.12% with one grab sample of 0.47%
BeO = 0.01 to 0.04%
Ta_2O_5 = trace to 0.02%
Nb_2O_5 = 0.02 to 0.04%

Černý (1978) considers greenish-grey to buff clay pods, from the central parts of the core zone, to be pseudomorphs after pollucite; the pods are penetrated by "a polygonal to braided network of lepidolite veinlets" and have a Cs_2O content of up to 0.24%.

Odd pegmatite

The Odd pegmatite, located 1600 m north of Rush Lake, is exposed at intervals over a length of 350 m, and consists of "albitite" and medium grained pegmatite.

Cassiterite crystals were discovered in the albitite phase of the dyke in 1929 by "Happy" White, P. Osis, and K.E. Miller. Following surface work in 1939, Northern Tin Mines Limited drilled 7 holes totalling 185 m in 1939-1940. After examination of the deposit by A.D. Bateman in 1942, the Department of Mines and Resources, Ottawa, under its strategic mineral war-time program, drilled 9 additional holes, totalling 677 m (Bateman, 1943). A report of the 1943 results, with a plan and section, are in ESS file 91480. Analyses for Sn, from drill holes and trenches, are shown in Figure 56.

In the eastern outcrop the pegmatite is only 90 to 330 cm wide, but persistent over a length of 100 m. It strikes 270° and dips vertically, being approximately but not exactly conformable with the adjoining schistose metagreywacke and mica schist. The dyke rock is mainly a greyish white aplite, containing scattered quartz eyes and disseminated small cassiterite crystals. The albite crystals show an alignment of grains subparallel to the contacts. A fine grained albite + quartz + pale greenish muscovite phase occurs along the walls of the dyke. Bateman (1943, p. 276) noted minute amounts of topaz and indicolite in the aplitic phase.

A second outcrop of the pegmatite occurs 140 m west from the west end of the previously described outcrop, and the dyke is exposed there over a length of 110 m. The dyke grades westward from the white aplitic albite to a pink fine grained pegmatite with aplitic phases. In a trench near the east end of this western outcrop, the dyke is exposed over a width of 275 cm; it consists of 91 cm of aplite, a pink feldspar zone, and a narrow quartz + muscovite + minor pink feldspar zone. The dyke strikes 270° and dips 85° south.

Bateman (1943, p. 276-277) described the occurrence of cassiterite in the eastern outcrop:

"Small cassiterite crystals are distributed throughout the albitite, but they do not occur within the pegmatitic border facies. For some curious reason most of the cassiterite and quartz eyes occur in the north half of the dyke. The amount of cassiterite is roughly proportional to the amount of quartz, and the larger the quartz eyes, the greater is the size of the cassiterite crystals. In places where the albitite is free from quartz it has a porcelain texture and contains only traces of minute cassiterite grains; but where quartz appears, the albitite has a tapioca texture, and the grain size and quantity of the cassiterite increase. Locally the albitite contains lumps of glassy quartz up to an inch or more in diameter and, in material of this nature, an occasional cassiterite crystal up to one-half inch long is encountered. The quartz eyes and cassiterite have a tendency to be arranged in long, thin lenses or streaks in the albitite."

Bateman (1943, p. 277) also gives detailed results of surface sampling and drilling. Analysis of 13 channel samples at intervals along the 100 m eastern outcrop indicated an average of 0.35% tin over a width of 142 cm (range: 0.18 to 0.59% tin; 72 to 394 cm). In the Northern Tin Mines drilling, 5 holes in this outcrop area gave values from 0.29 to 0.47% tin; the other 2 holes to the west failed to intersect the pegmatite.

A half-ton bulk sample assayed 0.30% tin, as well as 0.23% tantalum-columbium oxides. Bateman noted that "As no tantalite has been observed in the deposit it may occur in solid solution in the tin". Černý et al (1981) do not report any Ta-Nb minerals from the Odd dyke.

In the 1942 drilling by the Department of Mines and Resources, 6 of the holes intersected the dyke at a vertical depth of 30 m, over a length of 120 m. To the east, the dyke pinched out; to the west, it tapered to less than 30 cm in width. Three deeper holes intersected the dyke at a vertical depth of 61 m; the dyke averaged 0.15% tin over a width of 45 cm. It was concluded the dyke consisted of 11 350 tonnes of rock, containing 36 tonnes of tin, to a depth of 30 m (average grade of 0.32% tin).

Minor constituents in the dyke include pink garnet, apatite, traces of indicolite, and traces of fluorite.

In 1967, an additional 31 holes were drilled along the entire length of the exposure, and the pegmatite intersections were assayed for Sn, Ta_2O_5 and (a few) BeO (ESS file 91446). The drilling extended from 60 m east of the eastern outcrop, westward for 486 m, with holes at approximately 30 m intervals. All available assays for tin (Sn) are shown in Figure 56. Where present, tantalite content ranged between 0.01 and 0.04% Ta_2O_5, with one intersection grading 0.07% Ta_2O_5; this is substantially lower than the 0.23% tantalum-columbium oxides present in the 1942 bulk sample. Some splitting of the dyke is evident in some of the drill holes, and a second, narrow dyke appears to be present north of the east-central part of the main dyke.

Other pegmatites north of Rush Lake

Numerous other pegmatites intrude the metamorphic rocks north of Rush Lake. The most detailed map available is one at a scale of 1:2400 of the Bernic Group, Bernic Lake Mines Limited (ESS file 91447). Other similar maps cover the area to the east, including the Osis Lake and Birse Lake areas, showing many pegmatites and large areas of pegmatitic granite.

Numerous other reports of pegmatites are included in reports of assessment work on cancelled claims in the Bernic Lake-Booster Lake area. Sampling of trenches of several of the Yitt claims, northeast of the Tanco mine site, indicate low values of tin (0.02% to 0.18% Sn) and of tantalite (0.01 to 0.04% Ta_2O_5), as reported in ESS file 91300. Twenty-two separate pegmatites are noted on the geological map of the Yitt Group.

The pegmatitic granite body northeast of Osis Lake was drilled in 1971 by Tantalum Mining Corporation of Canada Limited on the Laser Group of claims (ESS file 91301). Tantalum or tin mineralization was not reported there.

During the present survey, a small amount of tantalite, identified by X-ray methods, was found in a sample from a pegmatite dyke located 1220 m at 50° from the northeast end of Rush Lake. The tantalite occurs as very fine needle-like blades in quartz. Tourmaline also occurs in the dyke, which is 95 m due north of the No. 3 post of W40267 claim, of the Laser Group. The dyke strikes 140°. Just west of the claim post, a pit 3 x 8 m and 2.5 m deep has been blasted into another, parallel pegmatite. Massive quartz has a banded and opalescent appearance, but rare-element minerals were not noted.

BIRSE LAKE PEGMATITE GROUP

Černý et al (1981) show the occurrence of 37 pegmatites in the area around Osis Lake, Birse Lake and Tin Lake (Fig 57): only one of these — the Rose dyke — has previously been reported in the literature. A description of the group is condensed from the report by Černý et al (1981).

"This group extends from Tin Lake   west-northwest to the northern side of Birse Lake and the southeastern part of Osis Lake. The Birse Lake pegmatites are essentially concordant to the bedding, layering and foliation of their host rocks.

"The shape of the pegmatite bodies tends to be irregular. Contorted lenticular forms predominate in the east, flat lenses and elongate dykes are typical of the western part. Dimensions reach about 1300 m in length (RNW) and 12 in width, but most of the bodies are considerably smaller.

"Internal structure of most of the Birse Lake pegmatites is patchy, with no regular relationship to the shapes of the bodies. Main assemblages are fine- to medium-grained albite + quartz + K-feldspar along the margins, and pods and schlieren of blocky K-feldspar-quartz grading into K-feldspar + tourmaline + quartz in a random manner. Only a few pegmatites (e.g. RQQ and parts of RNW) display concentric patterns of classic zoning.   Large patches of quartz (and quartz core where developed) tend to be partly rose in colour.

"Garnet and beryl are the only widespread accessory minerals in this pegmatite group.   Both are associated with medium grained or cleavelandite-like albite but separated from larger masses of the tourmaline + K-feldspar assemblage. Columbite-tantalite and amblygonite-montebrasite were found only in a single pegmatite (RNW), and heavily oxidized grains of triphylite-lithiophilite are also scarce. Thus the predominant mineralization carries Be, with Li (in the form of phosphates) and Nb-Ta being very sporadic."

"Beryl is pale greenish to off-white in all of its occurrences. Columbite-tantalite forms thin platy crystals bunched in radiating aggregates. Amblygonite-montebrasite occurs in small elongate grains which are difficult to distinguish from beryl."

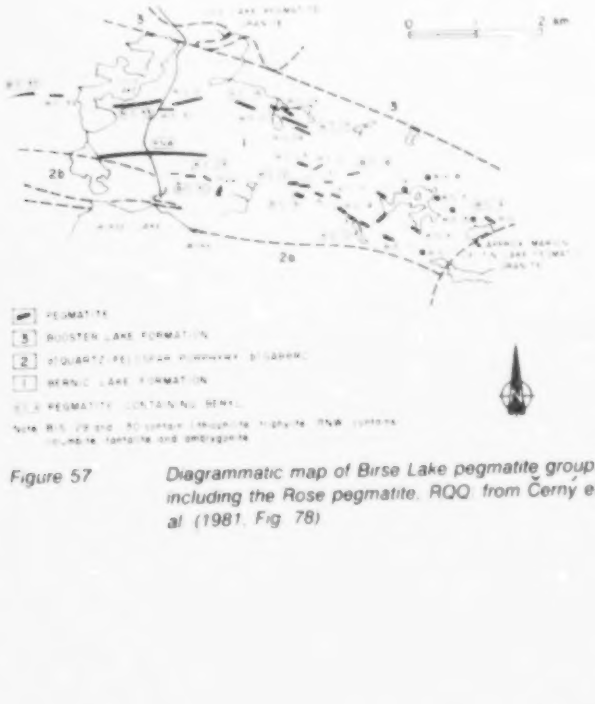


Figure 57 — *Diagrammatic map of Birse Lake pegmatite group, including the Rose pegmatite, RQQ; from Černý et al (1981, Fig. 78)*

Rose quartz pegmatite, north of Birse Lake

A pegmatite containing rose quartz, some of good quality, outcrops along a slope of a rock ridge, about 535 m north of the eastern end of Birse Lake. The pegmatite is exposed over a length of 40 m with a maximum width of at least 18 m.

The deposit was first staked as the Diamond claim by Peter Osis in 1927, then as the Rose claim by K.E. Miller in 1933, and later restaked as the Rose claim by R.J.R. Schaller in 1948. Pits have been dug or blasted into the pegmatite (see Mineral Inventory card 52L/6 QRT-1 in Bamburak, 1980). The central quartz core of the dyke has been the source of some rose quartz of good colour, although banded and white quartz is associated with it.

On its north side, the dyke is in contact with granitized schistose biotite-hornblende metasediments, striking 280°, dipping 88°N. At the east end of the outcrop, the pegmatite strikes 320° and appears to be vertical; north of the rose quartz pits, the strike of the contact curves to 285°, and is almost conformable with the schist.

A section measured down-slope across the dyke at the point of its greatest exposed width showed, from north to south:

0 - 1.2 m	Fine- to medium-grained pink albite, quartz, tarnished mica
1.2 - 6.0 m	Graphic pink to deep salmon K-feldspar and quartz, some tourmaline, both as shiny black, smooth crystals, and as intergrowths with quartz. Coarse grained towards core.
6.0 - 14.0 m	Quartz core, in knife-sharp contact with previous zone. At east end, it strikes 305° and dips south in places, otherwise it is vertical. One tourmaline crystal 23 cm long, 31 mm in diameter, occurs along the contact. Quartz, the only mineral in the core, occurs as: saccharoidal translucent to rose, glassy clear to deep rose, white banded, smoky banded, rose banded, and rose clear (in a block on the dump, one tourmaline crystal 28 x 11.3 x 7.6 cm occurs embedded in milky and rose quartz). The quartz core is exposed for 36 m along the south side of the rock ridge, but only the eastern half of this zone has been opened up. The south contact of the quartz core is not exposed.

At the eastern end of the outcrop, the quartz core diverges around a 1.2 m wide mass of microcline + quartz + tourmaline, that widens to 3 m at the edge of the drift-covered area east of the main rock ridge.

A colour photograph of a rose carved from the quartz from this dyke is included in a report by Parsons (1934, his Plate III), who considered carefully removed pieces of the rose quartz to be of high quality

PEGMATITES OF THE CAT LAKE AREA

Two major pegmatites, the Irgon and the Eagle, occur as long vertical dykes north and west of Cat Lake, respectively, intruded almost conformably into Lamprey Falls metavolcanics, and in places into granite (Fig. 58). Both dykes are predominantly gneissic, and spodumene occurring as intergrowths with quartz is the main rare-element mineral. Both dykes have been drilled, and an attempt was made in 1956-1957 to bring the Irgon dyke into production.

Numerous other dykes occur in the area, notably the F.D. No. 5 dyke located between the Eagle and Irgon dykes but of different texture, and the Central dyke, south of Cat Lake, that is flat-lying, coarse textured, and entirely within the Great Falls quartz diorite pluton (Maskwa Lake batholith portion). Other small dykes in the area contain beryl but are not economically significant.

Irgon pegmatite

A large spodumene-rich pegmatite outcrops across the northern part of the Irgon claim, located north of Cat Lake and accessible by Provincial Road 314. The Irgon claim was staked by Peter Osis in 1926. It was assigned in 1934 to Lithium Corporation of Canada Limited, the present holder.

The major dyke outcrops intermittently over a length of 400 m in a general east-west direction (Fig. 59), 520 m north of Cat Lake. At least six pits have been blasted into the eastern and central, wider parts of the dyke. The largest pit is now covered with waste rock. A total of 2044 m of diamond drilling indicated 1 091 800 tonnes of ore grading 1.5% Li_2O.

Between October 1956 and February 1957, a three-compartment

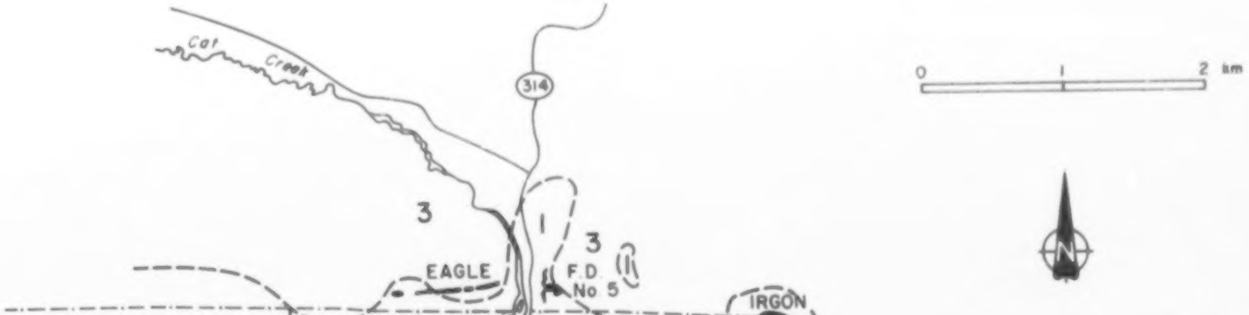

Cat Creek
314
0
1
2 km
N
3
EAGLE
1
3
F.D. No. 5
1
IRGON
1
3
CAT LAKE
1
2
CENTRAL
1
3
1
2
EUCLID LAKE
CAT LAKE ROAD
FAULT
GEOLOGICAL BOUNDARY
TRAIL
ROAD
MINESHAFT, COVERED
POWER LINE, ABANDONED
PEGMATITE
3 QUARTZ MONZONITE (Inconnu granite)
2 QUARTZ DIORITE (Great Falls pluton)
1 LAMPREY FALLS FORMATION: UNDIFFERENTIATED BASIC METAVOLCANICS AND METASEDIMENTS

Figure 58. Pegmatites near Cat Lake (Geology modified from Springer, 1948).

shaft was sunk to a depth of 73.5 m, 366 m of drifting parallel to the dyke and on the north side, and six crosscuts into the dyke, were completed on the '200' level. Spodumene ore from the crosscuts was stockpiled on surface. As a market for the spodumene was not available, operations ceased and since then all surface installations have been removed.

The dyke is characterized by a banded structure (Fig. 60), in places consisting of alternating bands of quartz + spodumene and quartz + feldspars + muscovite. Width of the dyke ranges from 3 to 18 m.

At the east end, the dyke is split by a metavolcanic septum. The south part is 6.7 m wide and the north part is 2.4 m wide. A section measured at the east end showed:

South contact	strike 110°
0 - 0.45 m	Clusters of tourmaline crystals and individual crystals mainly black, some green
0.46 - 0.61 m	Fine grained quartz + albite; quartz stringers

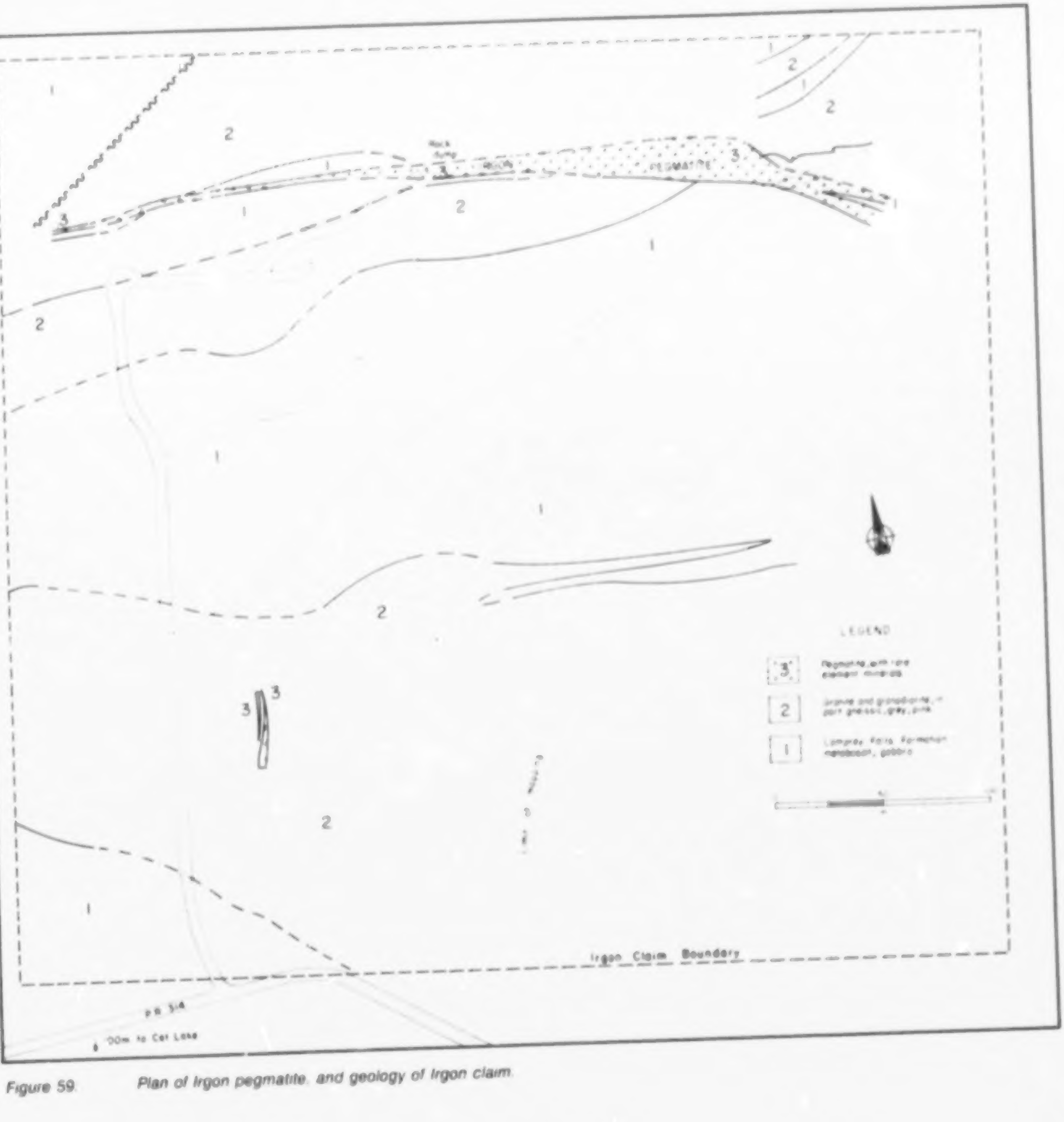

1
2
Rock dump
3
PEGMATITE
LEGEND
3 Pegmatite, with rare element minerals
2 Granite and granodiorite, in part gneissic, grey, pink
1 Lamprey Falls Formation metabasalt, gabbro
Irgon Claim Boundary
P.R. 314
100m to Cat Lake

Figure 59. *Plan of Irgon pegmatite, and geology of Irgon claim.*

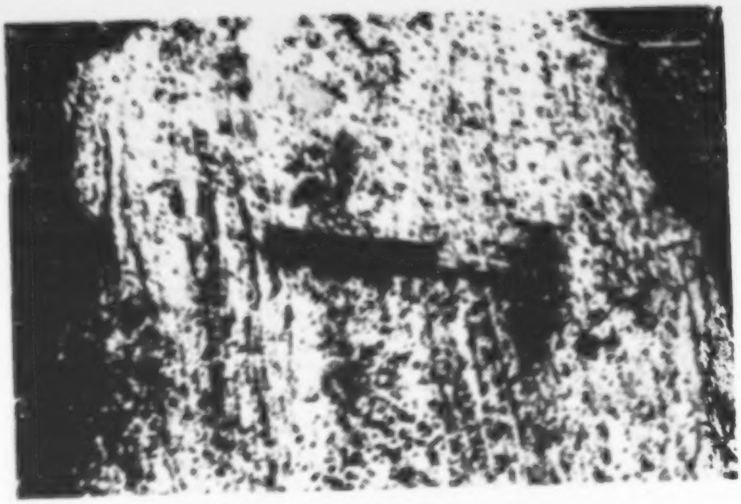


Figure 60 *Irgon pegmatite: well developed banded structure; hammer is 33 cm long.*

0.61 - 1.22 m	Aplite, albite, scattered clusters of spodumene, tourmaline and muscovite.
1.22 - 3.66 m	Banded albite + quartz, lensy, crosscutting stringers of quartz + spodumene 2.5 to 5 mm wide (Fig. 61), scattered pink and white albite megacrysts. Small red garnets in the fine grained patches.
3.66 - 5.59 m	Drift- and moss-covered.
5.59 - 6.71 m	Aplite, well developed banding parallel to interior contact, a few pink microcline megacrysts.
6.71 - 9.60 m	Metavolcanic septum.
North part	
South contact	strikes 125°, dips 70° to 75° south, parallel to schistosity of metavolcanic septum.
9.60 - 12.04 m	Aplite on south side, mainly banded quartz + albite, with patches of aplite.
12.04 m	North contact.

A cavity several centimetres across, lined with quartz crystals, was found along the south contact near the east end of the main pegmatite outcrop.

The Irgon dyke is exposed over its maximum width of 18.3 m at a distance of 76 m to the west. Aplite was noted along both contacts, and the persistent banded structure is evident. The wall rock consists of metavolcanics in some places, and granodiorite elsewhere. Spodumene-quartz aggregates appear to be most abundant at that location. Some spodumene crystals are pure white, but a cluster of several mauve crystals was noted. Coarse microcline megacrysts up to 60 cm across occur. The south contact strikes 110°.

Abundant spodumene was once visible in a pit to the northeast of the shaft site, but most of that area is covered with waste rock from the mine. To the west, the dyke narrows considerably and is 3.0 to 3.7 m wide. The strike is 90° and the dyke dips south at a steep angle. Pink aplite is present along the south contact. The main part of the dyke is well banded. Spodumene occurs both as clusters of crystals (Fig. 62) and distributed in bands, associated with quartz.

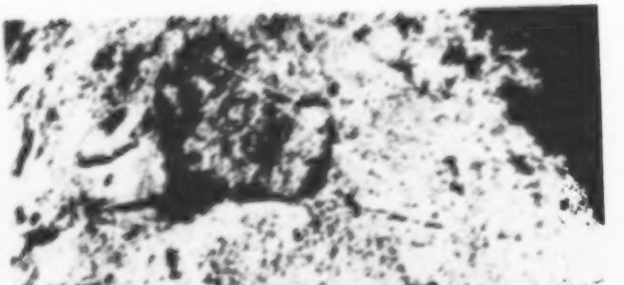


Figure 61: *Irgon pegmatite: cross-cutting quartz(Q)-spodumene(S) veins; hammer head is 15 cm long.*

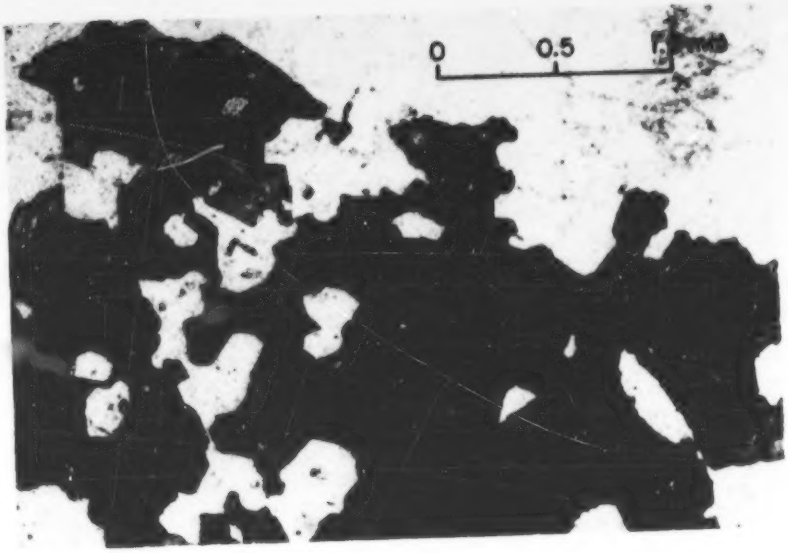


Figure 62 *Euhedral to subhedral quartz and diversely oriented spodumene, adjacent to quartz + albite + microcline (+ garnet), in the Irgon pegmatite*

F.D. No. 5 pegmatite

The F.D. No. 5 pegmatite outcrops on the eastern slope of a rounded granitic outcrop 250 m northeast of the outlet of Cat Creek at the western end of Cat Lake (Fig. 58). The F.D. No. 5 claim was staked by Robert Donner in 1942. The claim was assigned in 1947 to Northern Development Ltd., later Northern Chemicals Ltd. Some small surface trenches and 128 m of diamond drilling were completed. The property was assigned to Lithium Corporation of America Ltd. in 1949.

The pegmatite forms the eastern part of a dome-shaped outcrop 27 by 15 m. Along its west end, a coarse grained phase of the dyke is in apparent fault contact (strike 150°, dip vertical) with granitic rock. The north contact strikes 45° and is vertical. The pegmatite is in contact with porphyritic granitic gneiss. The dyke is sheared at its northwestern extremity, where the contact veers abruptly to 115°, for a length of 2 m to the gneiss.

The dyke is exposed over a width of 15 m. The south contact strikes 85° and dips 85°N. A shallow trench has been excavated across the eastern end of the pegmatite outcrop, and another small trench occurs along the north contact.

The pegmatite is massive and well crystallized, and differs notably from the Irgon dyke to the east and the Eagle dyke to the west, both of which show banding, particularly the Irgon.

Spodumene is abundant in parts of the exposed pegmatite. On the south side, deep green, bladed spodumene occurs mainly with quartz. Some euhedral translucent pale green beryl crystals, up to 25 mm across, were noted in a rock pile along the south edge of the pegmatite.

Pink microcline + white albite + spodumene + quartz forms much of the dyke. Spodumene crystals near the north contact have a bent structure. Black bladed flakes of biotite are abundant there. Tourmaline, apatite, garnet or accessory black minerals were not noted.

In two smaller outcrops located 45 m south of the main dyke, pegmatite containing microcline megacrysts in a medium grained quartz-spodumene matrix is poorly exposed. Some shallow pits have been blasted there.

Drilling results are not available for this deposit and tonnage estimates and grade have not been published. The deposit would appear to be considerably smaller than the adjacent Eagle and Irgon dykes; however, the eastward extent of the dyke is not known. The fault contact at the west end of the dyke is a peculiarity of this deposit, unless the Central pegmatite described below has been similarly offset.

Central pegmatite

A flat-lying spodumene-bearing pegmatite is exposed along the base of a cliff of granitic rock, 335 m south of Cat Lake. The location and access are shown in Figure 58. A trail leading to the dyke area starts from Provincial Road 314 at a point 1.3 km south by road from the old Cat Creek bridge east of Cat Lake. At present the lower part of the pegmatite is flooded behind a beaver dam and access to the outcrop is via that dam.

The dyke is exposed for 90 m along the base of the east-facing cliff of quartz diorite. Some trenching was done about the late 1920s. The deposit was first staked by F. Zeemel in 1926 as the Cat Lake M.C. It was restaked by A. Zeemel in 1933 as the Central claim. H. Johnson acquired the claim in 1955 and assigned it to Cat Lake Consolidated Metals Limited. Much of the broken rock from the trenches was covered by water, and the trenches themselves were flooded when the dyke was examined in 1973.

The southern part of the dyke is covered by water. Some beryl crystals have been reported there. The central part is exposed for 1.8 m above water level. The dyke is in flat-lying contact with the overlying quartz diorite (Fig. 63). A fracture face of a quartz diorite block exposed large sunbursts of tourmaline crystals.

The border zone consists of schistose biotite representing a sheared contact (Černý et al., 1981, p. 97). A wall zone is 10 to 20 cm thick and consists of yellowish muscovite + quartz, with some 'purpurite'. The remainder of the exposed dyke consists of a zone of white to pinkish medium grained microcline-perthite, containing 10 per cent quartz in fine- to medium-grained patches. This rock occurs interstitially to very coarse microcline-perthite crystals. In the lower part of this zone, and distributed irregularly within it, are spodumene-quartz intergrowths interstitial to coarse grained K-feldspar. The spodumene occurs both as fine grained needle-like crystals intermixed with quartz, and also in very coarse blades, reported up to 60 cm long by Mulligan (1956), of a pale greenish to yellowish-white colour. Coarse blades of spodumene 6 mm thick diverge at an angle of 20 degrees, and quartz occurs as a wedge between the blades. In a few places, some spodumene blades have been distorted.

Blocks of rock consisting of masses of fine grained greenish-grey mica were noted in the rock pile. The mica is intergrown with quartz and occurs in contact with white albitic aplite. Numerous blue apatite crystals 1 to 4 mm across occur in the aplite.

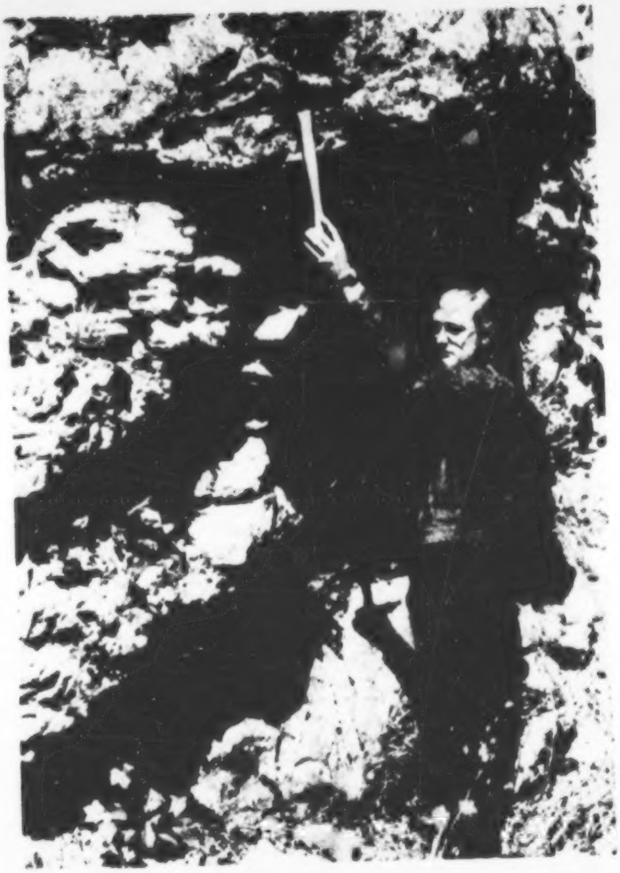


Figure 63 *Central pegmatite; pit below horizontal upper contact at top of hammer.*

Towards the northern end of the dyke, the contact changes attitude. It dips downward to 1.2 m above the water level and then, within a distance of 4.6 m, rises to 3.7 m above the water level. A lens of massive aplite is present in the quartz diorite 0.9 m above the ascending portion of the contact. It contains some coarse grained feldspar, parallels the contact, and is exposed over a length of 6.1 m.

Near the northern end of the main dyke, an area of 1.2 m by 0.3 m consists mainly of bladed greenish-white spodumene crystals, with quartz, within a zone of pink microcline.

Recently, the pegmatite was drilled by Tanco, and Černý et al. (1981) report:

> "The pegmatite, as defined by mapping and diamond drilling, is a subhorizontal tabular body averaging about 4 m in thickness (but varying between 1.10 and 7 m) and extending in excess of 500 m and 350 m in the north and east directions, respectively, through the Maskwa Lake quartz diorite. Two "rolls" are evident in the body, the axes of which plunge shallowly westward parallel to the dip direction of the pegmatite. The attitude of the pegmatite does not appear to conform to a recognized regional structural control, the host fracture being unique in this district."

They reported alluaudite and vivianite as possible alteration products of triphylite-lithiophilite, and also noted the occurrence of chrysoberyl. Beryl, tantalite, and cassiterite are reported as rare (op. cit., Table 42). The average Fe_2O_3 content of five samples of spodumene is 0.155 wt.% (range: 0.088-0.225); (op. cit., Table 46).

Dyke north of the Central pegmatite

Several small pegmatite dykes were located across the creek and north of the Central pegmatite (Fig. 58). Shallow pits have been blasted into the dykes. A few small white beryl crystals were noted, ranging in size from 3 to 12 mm across and 2 to 5 cm long. They occur in a quartz-muscovite zone. Other assemblages include red fine grained cleavelandite + greenish muscovite + quartz, and white albitic aplite + greenish-blue apatite, with small blades of a tantalite-type mineral. Spodumene was not noted, but the dykes are presently poorly exposed.

Dykes at southeast end of Cat Lake

Eight hundred metres east of the Central pegmatite and 150 m south of the shore of Cat Lake, several small pegmatite dykes occur toward the western end of a ridge of metavolcanic rocks. A poorly marked trail starts from Provincial Road 314, 0.5 km southwest of the old Cat Creek bridge east of Cat Lake, and extends west for 450 m to the dykes (Fig. 58). Spodumene and beryl occur in the dykes, which are irregular in shape and poorly exposed.

The largest trench in the area, 3 x 2.4 m and 1.2 m deep, has been blasted into a spodumene-rich section of one dyke. Along the north wall of the trench, the contact of the dyke strikes 100° and dips 60° south. The edge of the pegmatite consists of fine grained reddish cleavelandite + yellowish mica + quartz. A zone of fine- to medium-grained quartz-spodumene intergrowths is present. Spodumene blades are 3 to 6 mm wide and 9 to 20 mm long, the coarser blades occurring nearer the interior of the dyke. The next 1.35 m of pegmatite, as exposed in the east wall of the trench, is medium grained quartz + albite + spodumene with an average grain size of 25 mm. This zone contains abundant greenish-white spodumene in blades 25 mm or more in length. A zone with coarse grained perthite, white in the centre with pink rims, occurs along the south part of the trench. Also noted were some phosphate minerals (triphylite-lithiophilite, apatite), small white beryl crystals 4 to 8 mm across and up to 25 mm long, and patches of greenish muscovite. A smaller pit 6 m to the southeast exposes a probable extension of the pegmatite.

Pegmatites outcrop in the metavolcanics 38 m southwest of the main dyke. Two dykes are present and strike 100°. The larger dyke has been trenched to a shallow depth for a length of 6 m near the top of the cliff face. It consists of fine- to coarse-grained salmon red albite with abundant masses of quartz, some up to 30 cm across. Greenish triphylite is present, generally associated with the quartz. Černý et al. (1981, p.97) noted a few grains of Ti-enriched tantalite and manganotantalite; tourmaline and beryl occur in transecting fracture fillings.

Černý et al. (1981) noted five other small dykes, on either side of Provincial Road 314, east of Cat Lake (their dykes CAT-E to CAT-I), four of which contain accessory or rare beryl. A map of pegmatite occurrences in this area is in ESS file 91768.

Eagle pegmatite

The Eagle pegmatite, located northwest of Cat Lake (Fig. 58), consists of possibly ten or more separate dykes that outcrop over an area 823 m long and up to 30 m wide (Fig. 64). The maximum individual dyke size is 75 m by 9.1 m (Rowe, 1956).

The history of the staking and ownership of the claims covering the Eagle pegmatite is complex, and is outlined on Mineral Inventory card 52L/11 Li 4 in Bamburak (1980). The dykes were staked by L. Johnson in 1934. A total of 476 m of diamond drilling, in six holes was completed in 1944. Eleven trenches were blasted along the dykes in 1946. Mining Development Ltd., later Northern Chemicals Ltd., held the property from 1947 to 1954, when it was assigned to Lithium Corporation of America, Inc.

From the early exploration work, reserves were calculated to be 545 000 tonnes grading 1.4% Li_2O, to a depth of 60 m.

The general strike of the Eagle dykes is 77°, although the contacts are irregular. Drilling results suggest that the dykes dip between

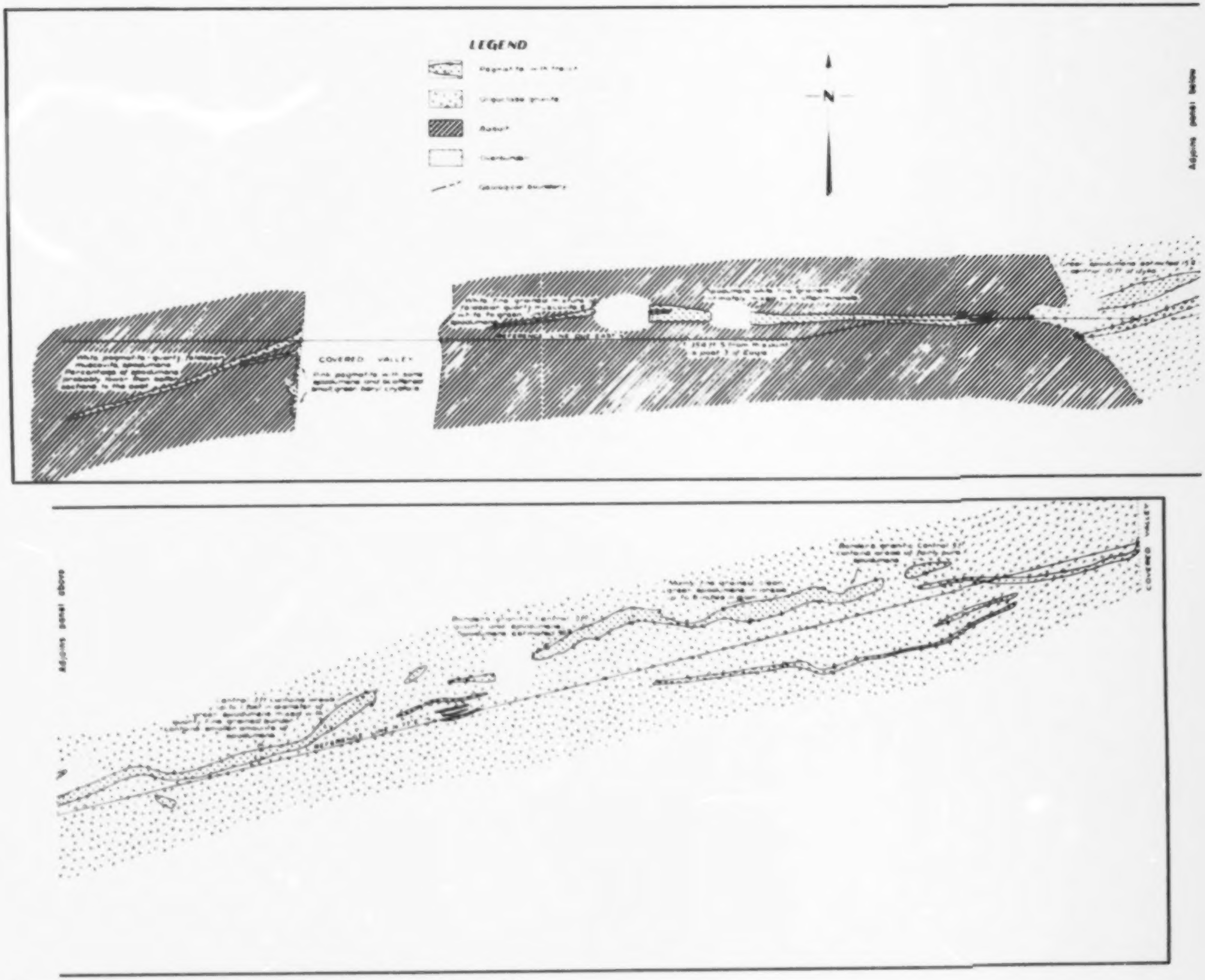

LEGEND
N
Adjoins panel below
COVERED VALLEY
Adjoins panel above
COVERED VALLEY

Figure 64: Plan of Eagle pegmatite, Cat Lake (map by Springer, 1950)

80° north and vertical, and that some of the wider surface pegmatites occur as multiple thin dykes at depth (Fig. 65). In the eastern 450 m, the wall rock consists of an oligoclase granite in which the mafic minerals in places have been streaked out. The granite is part of a long rock ridge along which the pegmatite outcrops near the crest. In the western 365 m, the wall rocks are amphibolite and schist. In that section generally only one pegmatite is present, as shown in the diagrammatic map by Springer (1949), reproduced as Figure 64. The metavolcanic rocks also form a ridge, which is cut by a north-south valley 90 to 150 m from the west end of the Eagle pegmatite. Along the west side of this valley, a beryl-bearing pegmatite is exposed.

The thickest exposures of pegmatite and the most abundant spodumene occur in the eastern half of the pegmatite zone. Quartz-spodumene stringers cut the pegmatites. Greenish spodumene crystals occur in radiating clusters 6.25 cm across, 20 m west of the cliff facing Cat Creek. Some individual spodumene crystals are 25 by 6 mm, and although most are straight, some are curved. The interstitial material between the spodumene clusters and crystals is exclusively quartz. The dyke in places has aplitic border zones consisting of white albite, with some quartz and muscovite, banded parallel to the dyke contacts.

The pegmatites in the granite pinch and swell along strike, and in places pinch out. The dykes have a complex structure. A typical cross-section where the dyke is a few metres wide shows:

Granite	north contact
Pegmatite	spodumene crystals — greenish mica
Aplite	fine grained phase
Feldspar-rich stringers	parallel to contact, with feldspar crystals up to 25 mm across
Spodumene-quartz bands	12 cm wide; spodumene plate faces perpendicular to contact, crystals oriented vertically
Spodumene-quartz stringers alternating with feldspar- quartz stringers	
Spodumene-quartz band along south contact	spodumene is a deeper green; crystals 5 cm long, bladed, and in radiating clusters 25 x 9 x 12 cm thick (with quartz), immediately along contact
Granite	south contact

Accessory minerals include minor black tourmaline, red garnet, and small pale greenish-white beryl. Springer (1948) reports some purple fluorite occurs near the contact. The aplite is concentrated towards the northern contact. The texture of the pegmatite is variable. Areas of fine grained pegmatite, with gneissic texture, contain feldspar megacrysts. The dyke has a general streaked-out or banded appearance, always parallel to the contacts. It is not as noticeably banded as the Irgon dyke. Local areas in the Eagle dyke are not overly 'gneissic'. A 6 mm biotite selvage is developed in places along the granite contact.

Spodumene crystals, intergrown with quartz, are abundant in the pegmatite in the central part of the section within the granite, and in a trench about 60 m east of the contact with the metavolcanics. The spodumene is fine- to medium-grained, 6 to 37 mm long.

The contact of the granite with the metavolcanic rocks is exposed. The foliation of the metavolcanics, striking 95°, is transected sharply by the granite, and in places the metavolcanics are partially granitized along the contact. The pegmatite within the metavolcanics is narrower, and generally only one dyke, with minor apophyses, is present. In places, the spodumene content appears to be low. It occurs as greenish to whitish crystals dispersed through a fine grained quartz + muscovite matrix. The dyke is 5.5 m wide at a point about 45 m west of the metavolcanic-granite contact.

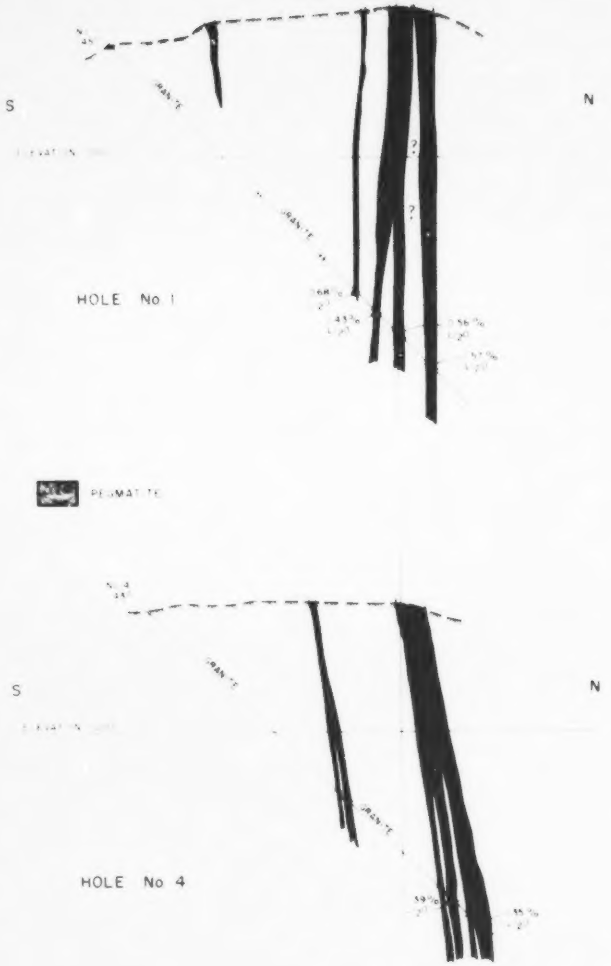


Figure 65 Cross-sections of Eagle pegmatite (MRD files)

Černý et al. (1981) noted, "columbite-tantalite was found in the Eagle pegmatite in tiny grains barely sufficient for X-ray diffraction identification".

A drift-covered valley separates two ridges of metavolcanics on which the Eagle dyke outcrops. West of the valley, the Eagle dyke is 1.8 to 2.4 m wide, and forms a pronounced ridge extending 30 to 90 cm above the metavolcanics. The pegmatite contacts strike 75° and are vertical, forming the lower edges of the ridge (Fig. 66). The foliation of the metavolcanics strikes 100° to 105°. The dyke has a well defined banded structure, and aplite occurs along the south contact. At the extreme western end, the dyke splits into two parts: the southern part consisting of fine grained pink pegmatite and the northern part being white. Spodumene, superficially somewhat difficult to distinguish from feldspar, is greyish white and occurs with dark quartz and white albite megacrysts. Fine grained muscovite, with a greenish tinge, occurs throughout. White albitic aplite is present also and has a streaked-out appearance.

Figure 66 *Eagle pegmatite, western end, the southern contact coincides with the cliff face at centre left.*

On the west side of the valley, and approximately 90 m east of the west end of the Eagle dyke, a crosscutting beryl-bearing predominantly pink pegmatite is exposed along the face of a cliff 9 m in height. The dyke strikes 10° and in one place dips 60° to 70° east. The true thickness is unknown as the eastern contact has been eroded. The dyke differs in mineralogy and somewhat in texture from the the Eagle dyke. The wall zone consists of pink medium grained feldspar (grading abruptly to aplitic albite), quartz, bluish tourmaline, white and pale green beryl, and abundant small pink to red garnets in places. Springer (1950) reports that this dyke contains spodumene.

Three parallel dykes, occurring 0.4 to 1.0 km west of the west end of the Eagle dyke, are reported as CUR-1, -2, and -3 dykes, containing accessory spodumene, by Černý et al. (1981, their Fig. 81).

PEGMATITES OF THE DONNER LAKE AREA

Several lithium-bearing pegmatites outcrop in the area 8 km west of Cat Lake, and 1.6 to 3.2 km northwest of Donner Lake (Fig. 67). The Main dyke outcrops on the former Spot 1 and 2 claims and the Northwest dyke on the Alex 1 claim. The High-grade dyke, on the Lithium 1 claim, is a small dyke containing abundant pollucite.

Claims were staked in the area in 1919, 1923, and 1928, but were cancelled in 1932. The Spot group was staked by P. Osis in 1943 and 1951, and in part by J. Donner in 1954. Geological surveys of the Spot group and adjoining claims were made in 1947 and 1955. The property was optioned to Violamac Mines Limited in 1955 and assigned to Lithia Mines and Chemicals Limited in 1956. In that same year some 34 drill holes totalling about 3000 m intersected spodumene mineralization of 'ore grade' over a length of 810 m out of a drilled length of 975 m in the Main dyke. At least three holes were drilled into the Northwest dyke. Several trenches were blasted into the pegmatites. Indicated and inferred ore reserves on the property are 3 629 000 tonnes grading 1.28% Li_2O. A more complete history of the property is available on Mineral Inventory card 52L/12 Li 1.

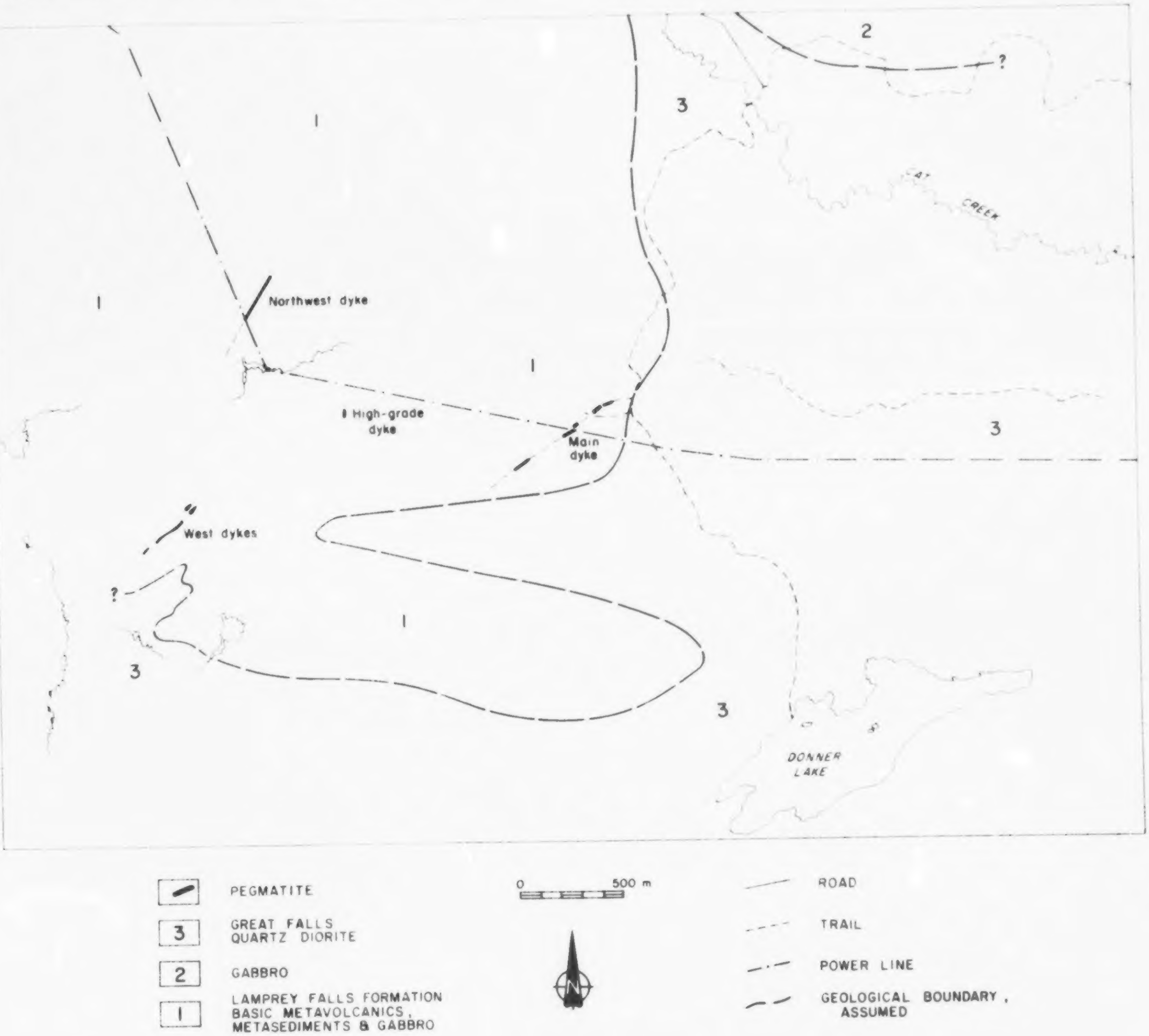

2
?
3
CAT CREEK
1
1
Northwest dyke
1
High-grade dyke
Main dyke
3
West dykes
?
1
3
3
DONNER LAKE
PEGMATITE
3 GREAT FALLS QUARTZ DIORITE
2 GABBRO
1 LAMPREY FALLS FORMATION BASIC METAVOLCANICS, METASEDIMENTS & GABBRO
0
500 m
N
ROAD
TRAIL
POWER LINE
GEOLOGICAL BOUNDARY, ASSUMED

Figure 67: *Pegmatites near Donner Lake.*

In 1981, the High-grade dyke was drilled by Tanco (D. Trueman, pers. comm.).

The pegmatites dip generally at a high angle and intrude metavolcanic rocks which have a limited areal extent. The metavolcanics are intruded also by granitic rocks on the south and east sides of the pegmatite area. A well defined body of glomeroporphyritic gabbro transects the volcanics and is itself cut by the Main dyke. The gabbro is well exposed along the powerline on the Spot 1 claim.

Regional lineaments, reflecting strong shearing, trend in a northeasterly direction. However, the pegmatites show little evidence of deformation.

Main dyke

Several outcrops, generally low rounded knobs of pegmatite, occur intermittently over a distance of 610 m on either side of the powerline crossing the Spot 1 and Spot 2 claims. The drill results indicate the dyke extends an additional 365 m to the southwest into the Spot 3 claim. North of the powerline, the dyke strikes 55°. The contact with the metavolcanics is exposed near the northeastern end, and dips 80° northwest. In another exposure 90 m to the southwest, the dip is 67° to 72° to the northwest. The drilling results indicate that the dyke has a progressively shallower dip at depth (Fig. 70) decreasing to about 45° at a depth of 200 m.

A narrow wall zone of pink albite, quartz, and fine grained muscovite is present on each side of the dyke. The major part of the dyke consists of greyish-white spodumene in a matrix of greyish-white albite + microcline + quartz. Tourmaline was not evident.

The spodumene occurs in most outcrops as bladed and acicular crystals, generally 10 to 80 mm long and 3 to 6 mm wide. Abundant finer grained spodumene, 1 x 5 mm or less, is present. One area of coarse-bladed spodumene, with blades up to 1 x 5 cm was noted near the northeastern end. A few blades are a distinctive pale mauve. The spodumene occurs concentrated in patches. In places, the blades are

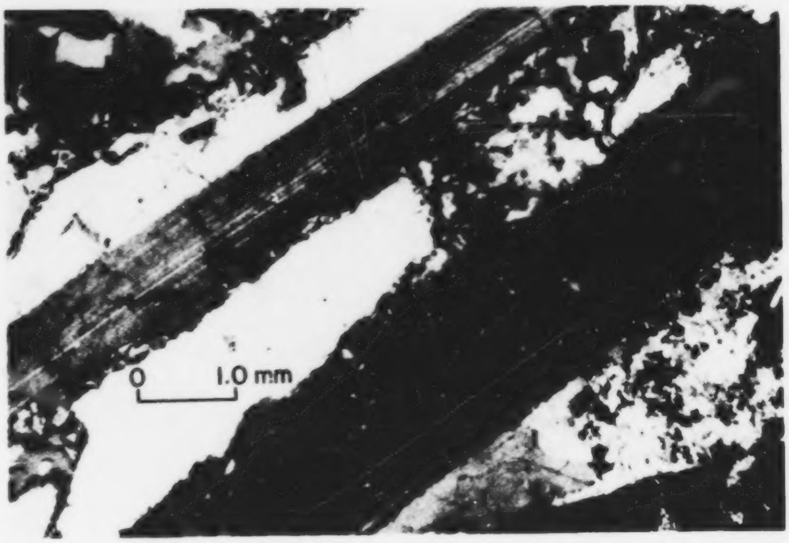


Figure 68

Twinned laths of coarse spodumene separated by quartz, very fine grained quartz + muscovite + albite-oligoclase along contacts, interstitially, and in veinlets cutting fractured spodumene; Main dyke, Donner Lake.

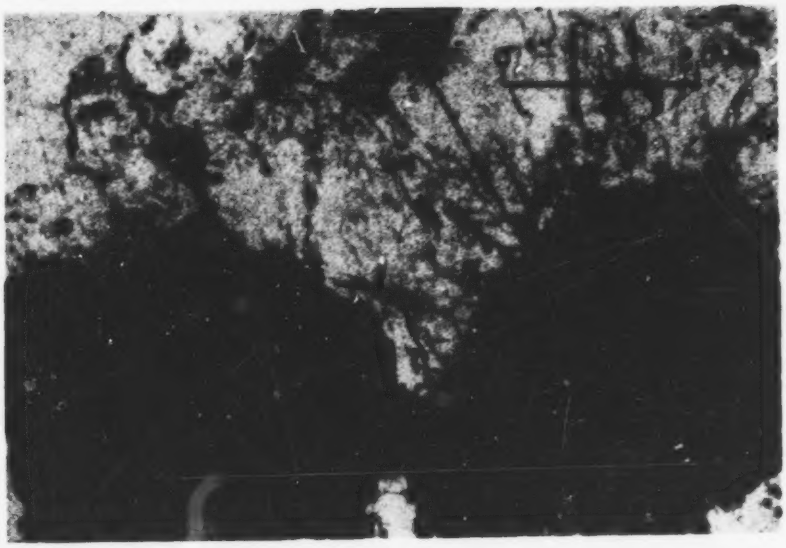


Figure 69:

Cross-sections of coarse spodumene in microcline + quartz matrix, spodumene grain at left consists of a central area of clean, fractured spodumene, bordered on both sides by spodumene-quartz intergrowth; Main dyke, Donner Lake (Crossed nicols).

oriented perpendicular to the contact and show a distinct banding. They occur to within at least 1 cm of the contact as bladed crystals at least 8 x 12 mm. In other places, the crystals are more diversely oriented. Some coarse white K-feldspar crystals occur in places close to the central part of the dyke. The dyke shows no major zoning, only a change to pinkish feldspar towards the contact. Tantalite has been identified by X-ray powder photograph, but its occurrence is rare.

The Main dyke is not one single pegmatite, as shown both in surface outcrops and by drilling. At the powerline, two outcrops of parallel pegmatites are 20 m apart. A pit in the pegmatite to the southeast of the powerline shows the dyke in contact with glomeroporphyritic gabbro. The dyke is 2.1 to 2.7 m wide, and can be traced downslope northeast from the pit for more than 30 m as a narrow ridge extending above the gabbro. It appears to narrow and become a banded aplite.

The Main dyke can be traced some distance to the southwest along a cut line that strikes 52°. It has been trenched 275 m from the powerline. There it consists of coarse grained bluish-white K-feldspar in a fine grained quartz + albite matrix in which bladed spodumene crystals are disseminated. The spodumene laths are generally 6 to 19 mm long and 1.5 to 3 mm wide. Photomicrographs of the spodumene are shown as Figures 68 and 69. Holmquistite is developed along the southeastern contact with a finer grained phase of the gabbro.

The Main dyke has been drilled over a length of 975 m, and in some detail to a depth of 250 m; limited drilling has been done to a depth of 305 m. Total length of the spodumene ore zone is 810 m and average width is 3.3 m. Indicated tonnage, extrapolating to a depth of 250 m is 1 850 000 tonnes grading 1.30% Li_2O. An additional 393 000 tonnes of similar grade is inferred between depths of 250 and 305 m. Davies (1958) reported an outstanding feature of the dyke is its uniformity of both width and grade, both along strike and down dip. This is confirmed by the recently released drilling results (Fig. 70).

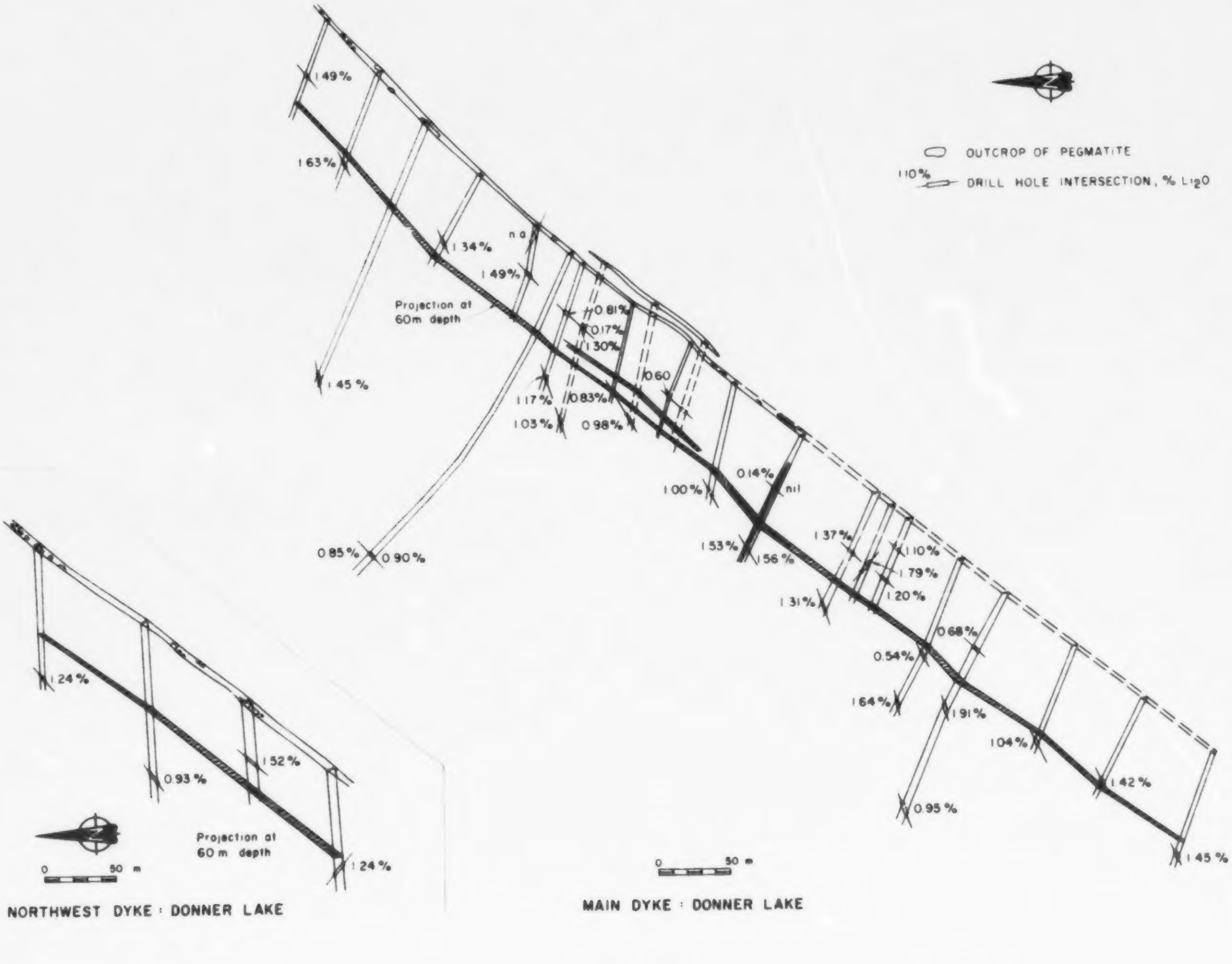

OUTCROP OF PEGMATITE
1.10% DRILL HOLE INTERSECTION, % Li_2O
N
1.49%
1.63%
n.a.
1.34%
1.49%
Projection at 60m depth
1.45%
0.81%
0.17%
1.30%
0.60
1.17%
0.83%
1.03%
0.98%
0.14%
nil
1.00%
1.53%
1.56%
0.85%
0.90%
1.37%
1.10%
1.79%
1.20%
1.31%
0.68%
0.54%
1.64%
1.91%
1.04%
1.42%
0.95%
1.45%
0
50 m
MAIN DYKE : DONNER LAKE
1.24%
0.93%
1.52%
Projection at 60 m depth
1.24%
0
50 m
NORTHWEST DYKE : DONNER LAKE

Figure 70: *Drilling results, Donner Lake pegmatites; Main dyke and Northwest dyke; data from drill hole logs in ESS file 91769.*

High-grade dyke

A pegmatite containing spodumene and lepidolite on the Lithium 1 claim is notable for its concentration of pollucite. Samples collected by Davies in 1955 were used in a mineralogical study by Bristol (1962) in which she identified pollucite by X-ray methods. The dyke was examined by P. Černý, L. Solkoski and the writer in 1974, after it had been located with the aid of a geological map of the claims, supplied by J. Donner.

The dyke is exposed along the eastern side of a large outcrop area of fine grained, massive metavolcanics, about 250 m south of the powerline clearing (Fig. 67). The dyke is exposed over a length of 18.3 m and is 0.6 to 1.2 m wide. The main trench is shallow and water-filled, and has been blasted into the central part of the exposure. The western contact is exposed and strikes 170° and dips 65° west. Holmquisite in bladed crystals is well developed in the metavolcanics along the western contact.

The western wall zone consists mainly of white cleavelandite oriented perpendicular to the contact. The internal structure of the pegmatites has been largely obscured by the blasting, but broken rock around the trench shows various phases of the dyke:

an interlocking mass of pale mauve spodumene
purple lepidolite
glassy pollucite
chalky 'altered' pollucite, slightly porous
greenish pollucite alteration (mixed layer silicate)
glassy pink to purplish-pink rubellite, euhedral, associated with the pollucite and the 'altered' pollucite
quartz
K-feldspar, coarse white, minor amount, in gneissic phase
aquamarine beryl

Variations include masses of white to very pale mauve spodumene in coarse blades, and bipartite veinlets and narrow stringers of flaky lilac lepidolite transecting both pollucite and 'altered' pollucite.

One blasted fragment has a streaked-out appearance, somewhat like the texture of the Irgon pegmatite. However, it contains coarse white K-feldspar with 3 mm wide bands of purple lepidolite, and a 10 by 10 cm cluster of divergent white spodumene blades.

Some aplite is present in the dyke and in places has a banded appearance. It is a mixture of about 85 per cent fine, white albite needles with about 15 per cent fine- to medium-grained quartz. The only tourmaline noted in the Donner Lake area was in this dyke, and minor black tourmaline was noted in the southern outcrop.

The mineralogy of the dyke is of possible economic interest because it indicates the occurrence at one time in this area of the advanced fractionation necessary for the concentration of sufficient cesium for the formation of pollucite. (It is one of two occurrences of pollucite in surface exposures in Manitoba, the other being in a dyke at Red Cross Lake. The large bodies of pollucite in the subsurface Tanco pegmatite have been described).

Three metres north of the main trench, both contacts of the dyke are exposed. It is only 0.6 m wide. In another outcrop 8 m farther north, the dyke is exposed over a length of 2.4 m and is 1.1 m wide. There it consists of coarse K-feldspar, quartz, and pollucite. Pegmatite is exposed also in a small outcrop 12 m south of the main trench; there it exhibits irregular contacts and is either an offset part of the above dyke or is a separate dyke.

Preliminary results from recent drilling of this dyke are reported by Černý et al (1981, p. 99):

> "It has been drilled for 150 m along the strike; its thickness reached a maximum of 1.80 m and is variable both along strike and downdip. Its lower extremities have not been reached to date. Contacts with the metabasaltic wall rock are mostly sharp, except for a few structurally disturbed spots of feldspar diffusion into the greenstone, and they are sporadically lined with holmquisite.
>
> "Internally, the dyke is extremely but patchily differentiated with superimposed metasomatic assemblages. Typical primary assemblages are blocky K-feldspar + quartz, pollucite + quartz, and quartz + spodumene. Albitization is very widespread, replacement units of lepidolite are spotty but extremely rich in this mica, to the exclusion of all other minerals."

They reported rare columbite-tantalite and microlite, and that a few "crystals of white anhedral beryl were noted in the drill cores."

Northwest dyke

A large pegmatite was discovered by John Donner in 1955, about 1.6 km northwest of the Main dyke. Four holes were drilled on the dyke by Violamac Mines Limited (Fig. 70).

The dyke, on the Alex 1 claim, strikes 42° and dips nearly vertically. It crosses a ridge of metavolcanics along the powerline right-of-way 75 m north of the first outcrop northwest of a large swamp (Fig. 67). A trench has been blasted into the pegmatite along the western edge of the clearing. The dyke outcrops along the southeast side of a shallow valley 6 m wide that has a somewhat similar strike. Several other low outcrops of the dyke, usually with some spodumene, and some with curvilamellar lithian muscovite, were noted over a distance of 230 m to the northeast, along the southeast side of the valley. The pegmatite there forms a ledge on the slope of a large metavolcanic outcrop.

In the area of the main trench, vertical cross-fractures strike 80°. The west end of the pegmatite has been displaced a total of 1.8 m to the northwest along these fractures. The wall rock is fine grained metavolcanics, the foliation also strikes 80° and is vertical.

The wall zone of the dyke is a fine grained mixture of quartz + grey albite + muscovite. One feature of the dyke is the occurrence of spodumene-quartz intergrowths in discrete blade-shaped patches, many over 10 cm long and 1 to 2 cm wide, pseudomorphic after petalite. In the trench, these patches are weathered orange to pink. Within the patches, the quartz content is variable and the orientation of the spodumene laths is generally transverse to the long axis of the patches. However, in places the blades form either a criss-cross pattern or a divergent pattern, the latter looking much like cleavelandite. On some faces the spodumene-quartz forms 30 to 50 per cent of the dyke. The matrix between the spodumene-quartz areas consists of coarse, white and grey K-feldspar crystals and a very fine grained aplitic albite + quartz + muscovite mixture.

Violamac Mines Limited reported the dyke has been drilled over a length of 350 m and to a depth of 137 m. Its average width is 4.5 m. Indicated ore reserves to the 137 m depth are 603 000 tonnes grading 1.245% Li_2O. Three samples of spodumene from the High-grade dyke were found to have a low iron content averaging 0.073% Fe as Fe_2O_3 (range 0.064-0.087%), as reported by Černý et al. (1981). Samples of spodumene from the Northwest dyke showed a "rather high Fe content, the majority of which comes from clayey alteration of the mineral."

Other pegmatite dykes containing spodumene occur in the Donner Lake area (Davies, 1958; Černý et al., 1981). Detailed maps of the pegmatites, as well as drilling results from 1956-1957, are available in GDS file 91769.

PEGMATITES AT CROWDUCK BAY, WEKUSKO LAKE

The localities of rare-element pegmatites in northern Manitoba, described in the remainder of this report, are shown in Figure 71.

Three separate groups of lithium pegmatites have been reported from the Crowduck Bay area (Fig. 72), which forms the northeast outlet of Wekusko Lake along the Grass River system. The pegmatites occur in a variety of rock types: a) within greywacke and fragmental rocks of the Missi Group (Combined Developments); b) in metavolcanics and interbedded clastic rocks of the Amisk Group (Green Bay); and c) within metamorphosed acid to basic plutonics, near a contact with biotite granite (Sherritt Gordon). Several small deposits of gold occur within the area a few miles south and east of the narrows at the south end of Crowduck Bay.

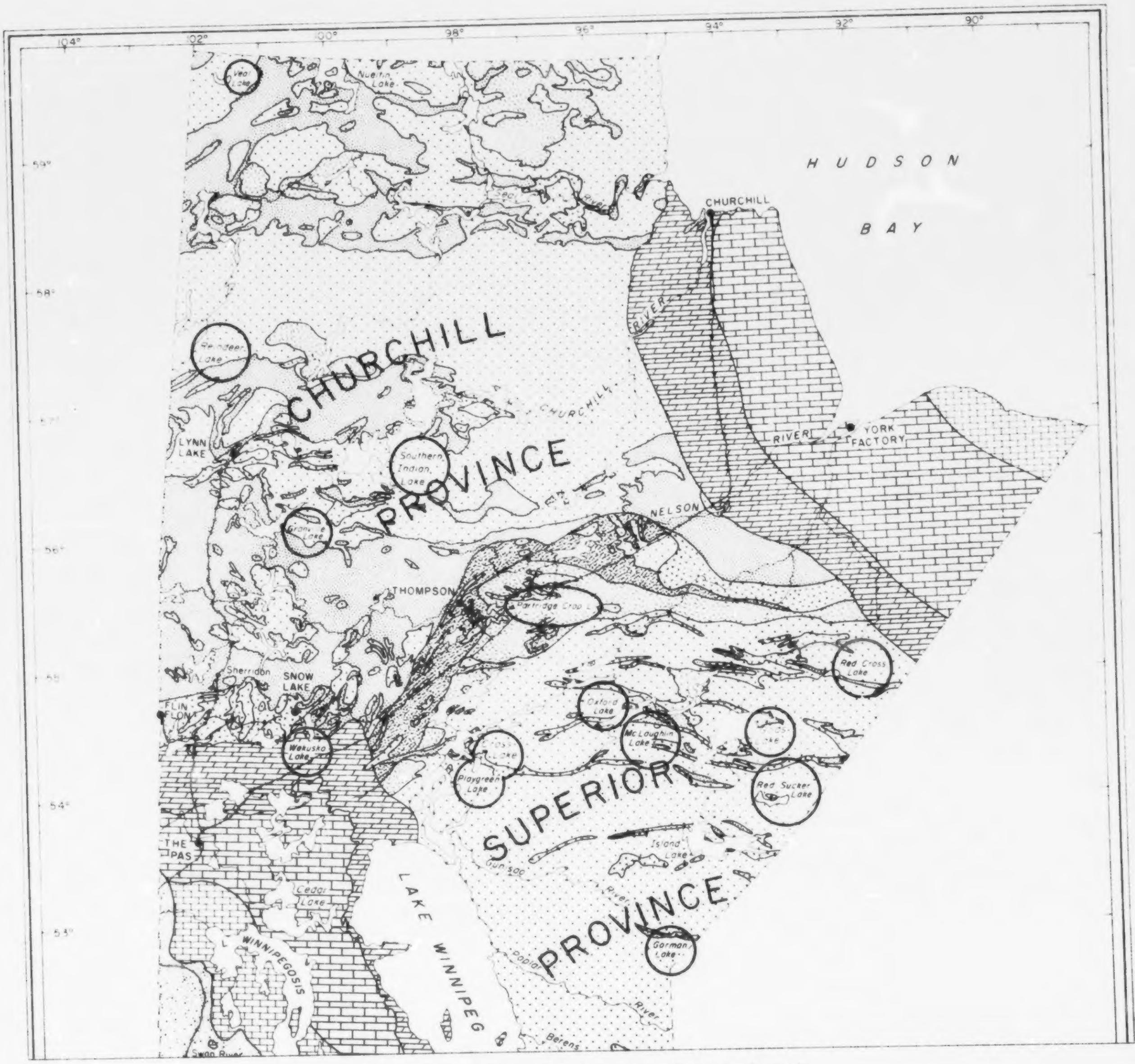

104°
102°
100°
98°
96°
94°
92°
90°
59°
58°
57°
56°
55°
54°
53°
Veal Lake
Nueltin Lake
HUDSON
BAY
CHURCHILL
RIVER
Reindeer Lake
CHURCHILL
PROVINCE
LYNN LAKE
Southern Indian Lake
RIVER
YORK FACTORY
NELSON
THOMPSON
Partridge Crop L.
Red Cross Lake
Sherridon
SNOW LAKE
FLIN FLON
Oxford Lake
McLaughlin Lake
Wekusko Lake
Playgreen Lake
Red Sucker Lake
SUPERIOR
PROVINCE
THE PAS
Island Lake
Gunisao
River
Cedar Lake
LAKE WINNIPEG
WINNIPEGOSIS
Poplar
River
Gorman Lake
Berens
Swan River

Figure 71: *Locality map, rare-element pegmatites in northern Manitoba. (See Fig. 1 for legend).*

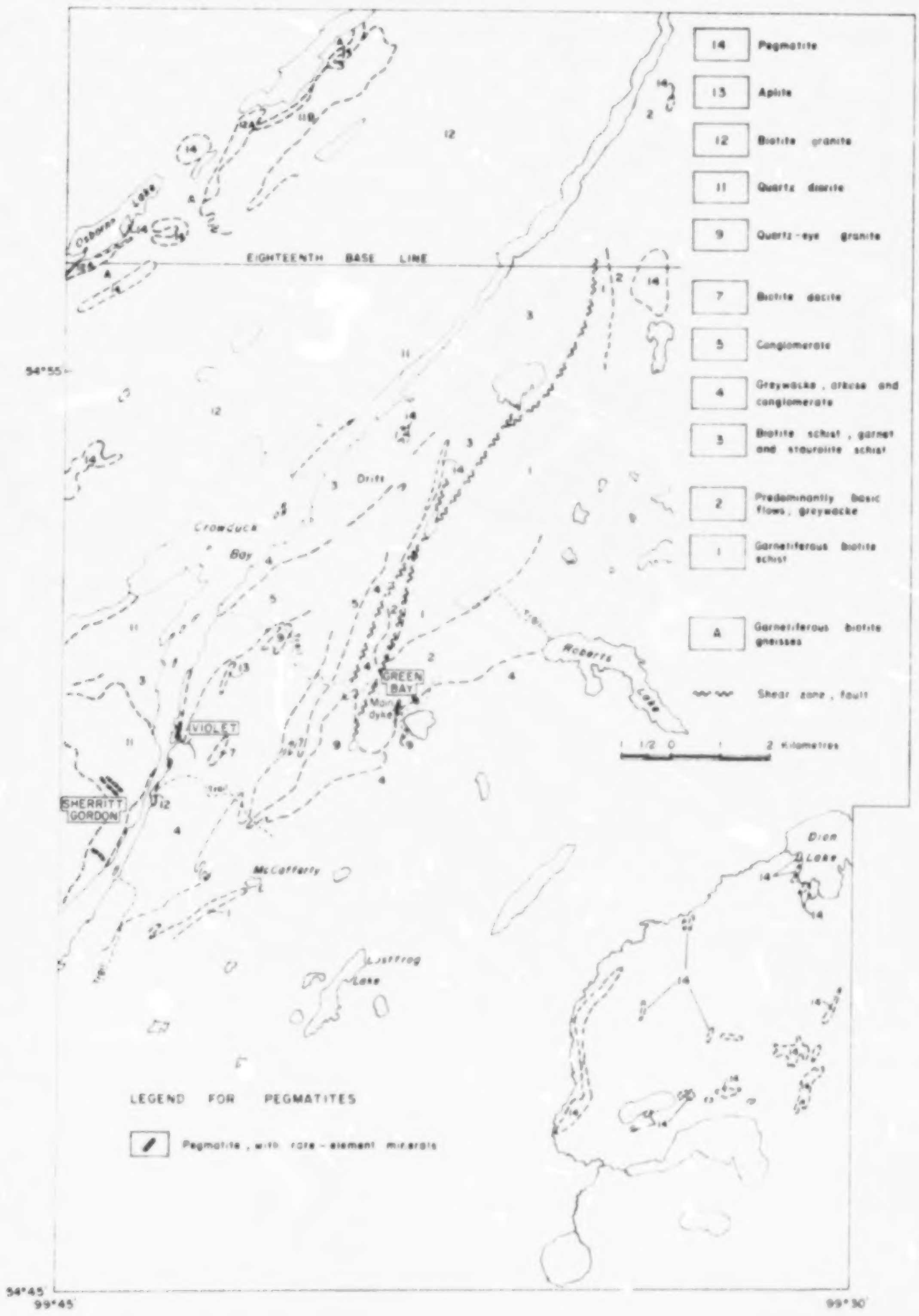

14 Pegmatite
13 Aplite
12 Biotite granite
11 Quartz diorite
9 Quartz-eye granite
7 Biotite dacite
5 Conglomerate
4 Greywacke, arkose and conglomerate
3 Biotite schist, garnet and staurolite schist
2 Predominantly basic flows, greywacke
1 Garnetiferous biotite schist
A Garnetiferous biotite gneisses
Shear zone, fault
1/2 0 1 2 Kilometres
EIGHTEENTH BASE LINE
Osborne Lake
Crowduck Bay
Drift
GREEN BAY
Main dyke
VIOLET
SHERRITT GORDON
Roberts Lake
McCafferty
Lostfrog Lake
Dion Lake
LEGEND FOR PEGMATITES
Pegmatite, with rare-element minerals
54°55'
54°45'
99°45'
99°30'

Figure 72 Crowduck Bay, Wekusko Lake generalized geology (from Frarey, 1950)

On the Sherritt Gordon property, the two main dykes, discovered in 1931, outcrop near the junction of the Gold Reef 5, 6, 8 and 9 claims. A third dyke, 0.9 km to the south, outcrops near the northeast corner of Gold Reef 1 claim.

The numerous lithium pegmatites on the other two properties were discovered in 1953 and 1955; stripping and diamond drilling were carried out by Green Bay Mining and Exploration Ltd. and Combined Developments Limited, both of Edmonton. Russell (1957) suggests this work outlines a belt of ground 40 km long that is favourable for prospecting. Mulligan (1957, p. 121) concludes that an external structural control, by faulting or jointing, is suggested for the pegmatites in the few areas that have been mapped in detail. Černý et al. (1981, p. 201) report that "The three groups of Li, Be, B-enriched pegmatite ... penetrate late subvertical dilation fractures and extend to considerable depth along them. The pegmatites can only be related to a probably igneous source concealed at depth", as extensive geochemical evidence rules out known Wekusko Lake pegmatitic granites as parental intrusions.

Sherritt Gordon Mines Limited: Gold Reef Claims

The property is located 9 km east of north from Herb Lake settlement, and west of the narrows at the south end of Crowduck Bay. The area was originally staked as the Gold Reef group of 12 mining claims by Peter Kobar in 1931. By 1932, three pegmatites had been outlined on the surface (Fig. 73). The property is held by Sherritt Gordon Mines Limited. The main dyke, the central of the three described, has been traced for 275 m by 20 diamond drill holes (ESS file 92182).

The country rocks around the pegmatites are gabbro, and gabbro porphyry grading to quartz diorite.

The most northerly dyke strikes between 295° and 290°, and has been traced in intermittent outcrops and trenches for 503 m; the dip at one place is 65°SW. Near the east end, the dyke appears to be nearly vertical, and at the east end it splits into two dykes, each 0.5 m wide. The width ranges from 1.4 to 5.2 m, and averages about 2.1 m. The dyke may be a series of discontinuous lenses of pegmatite. The dyke consists of pink and white K-feldspar and albite, quartz and abundant pale greenish spodumene, and one exposure shows spodumene crystals 0.6 m long. Quartz is fairly rare in this dyke, but one block of massive quartz was noted in a trench in the central part of the exposed length. Towards the northwest end, an outcrop shows a 3 m width of pegmatite. It consists of dark red feldspar, mainly albitized K-feldspar, and fine grained silvery mica with a purplish tinge. Spodumene is not present in this outcrop, and is scarce in the most westerly 90 m of the pegmatite. Other poorly exposed pegmatites are present near this dyke.

The main pegmatite on the property occurs about 79 m south of and roughly parallel to the first dyke; the strike is variable from 305° to 285°. The dyke averages 5.5 m wide (ranging from 2.1 to 10 m), and is well exposed in several outcrops over a distance of 213 m; it has been traced by diamond drilling for a length of 274 m, and scattered outcrops to the northwest indicate a total length of more than 335 m. The greatest width is at the southeast end, where its extension is covered by drift. The dyke has a narrow wall zone of pink albite + K-feldspar + quartz + muscovite; this zone is generally 0.3 to 1.2 m wide, along both contacts. Muscovite has an orientation perpendicular to the south contact in one outcrop. The central zone contains apple green spodumene, in crystals commonly 15 cm long, and up to 45 cm long, and forming 30 to 33% of the central zone over the main 213 m outcrop zone. Black tourmaline occurs in patches, in many places associated with the spodumene. A few small crystals of golden beryl, red garnet, and minor blue-green triphylite are present. Most of the outcrops consist of cleavelandite + perthite + quartz + spodumene + muscovite pegmatite. In places, many of the spodumene crystals, which are mostly 2.5 to 15 cm in length, are oriented perpendicular to the contacts. Spodumene occurs within a few cm of the south contact, and within 45 cm of the north contact. White to pink perthite is predominant, and occurs in masses up to 20 cm or more across, and in aggregates of crystals up to 0.9 m in length. White to pink cleavelandite is fine grained. Most of the muscovite is medium grained, in books to 7 x 4 cm and 12 to 25 mm thick. Bright bluish green apatite is a common accessory. Some anhedral, white to cream beryl, 15 mm across, was noted.

The results from 19 shallow holes, at 15.24 m intervals along the main dyke, and one deeper hole that intersected the dyke at 46 m, were reported by Rowe (1956): "The pegmatite cut by the 19 shallow holes contained an average of 13.57% spodumene over an average width of 18.5 feet [5.6 m], and that contained by the deeper hole contained 23.1% spodumene over 14 feet [4.3 m]." A channel sample taken by F.B. Evans across the main dyke is reported to have assayed 1.5% Li_2O. The dip of the dyke is reported by Černý et al. (1981) as 50° to 70° southwest.

Test work indicated that crushing to + 1/4 -1/2 inch liberated most of the spodumene, and Sherritt Gordon reported that sink and float concentration tests could produce a spodumene concentrate.

The spodumene has a distinctly pale greenish colour, and occurs as bladed crystals, generally associated with quartz. Some blades are slightly curved, some definitely kinked, and others are broken along fractures; most are flat, and smooth or striated. A few spodumene crystals have a bright red narrow rim of hematite. Some, up to 20 mm across, have a euhedral pyroxene-type octagonal cross-section.

The dyke contains an aplite phase, consisting mainly of albite (pinkish grey to white) with abundant small black tourmaline needles, and accessory mica and apatite. It occurs along the north contact, and is found in blocks from the trench along the west end of the main outcrop where the aplite is in contact with the spodumene-bearing zone.

The third dyke outcrops near the northeast corner of Gold Reef 1 claim. In the main outcrop, the pegmatite strikes 290°, is 7.9 m in width, and is exposed for 21.3 m along the north side of a low ridge. This dyke is coarser grained, where exposed, containing perthite crystals 15 to 30 cm across, and well bladed crystals of spodumene, reported up to 120 cm long. The blades occur in clusters associated with pink K-feldspar, perthite, quartz and some beryl. The spodumene content is less than in the northern dykes, and is estimated at 20% over the western 18 m of the outcrop. The wall zones are generally wider. The dyke has been traced over 425 m, but the spodumene content is variable. The dyke can be reached by trail from the narrows of Crowduck Bay.

An analysis of the spodumene (Mineral Inventory card 63J/13 Li 2, in Bamburak, 1980) showed:

SiO_2	63.94%
Al_2O_3	28.60%
CaO	0.15
Li_2O	6.80
Na_2O	0.81

Černý et al. (1981) report the Fe as Fe_2O_3 content of 4 samples of spodumene averages 1.178%, ranging from 0.96 to 1.40%.

The relative quantity of spodumene and quartz varies greatly from outcrop to outcrop, and within a single outcrop. The dyke is characterized by masses of quartz, over 30 cm across, associated with pinkish microcline and perthite megacrysts. Muscovite is associated with the quartz and microcline.

The dyke transects a "packed" porphyry (90 per cent plagioclase phenocrysts). The spodumene content appears to be lower in the eastern half of the outcrop. Some aplite, cleavelandite + quartz, occurs along the north contact of the dyke. In places, beryl is associated with the spodumene.

Intermittent outcrops of the pegmatite occur along a cut line along the eastward extension of the dyke towards Crowduck Bay Narrows. One outcrop, about half-way to the lake, has a trench 1.2 x 3.6 m, in which the pegmatite consists of greenish spodumene + pink perthite + quartz; coarse muscovite is present. The wall rock is a gneissic variety of the "packed" porphyry. Results of 7 shallow drill holes and 1 deeper hole along the southern dyke are available in ESS file 92182.

One estimate of reserves in the main dyke on the Sherritt Gordon property is 203 000 tonnes grading 1.2% Li_2O to a depth of 45 m.

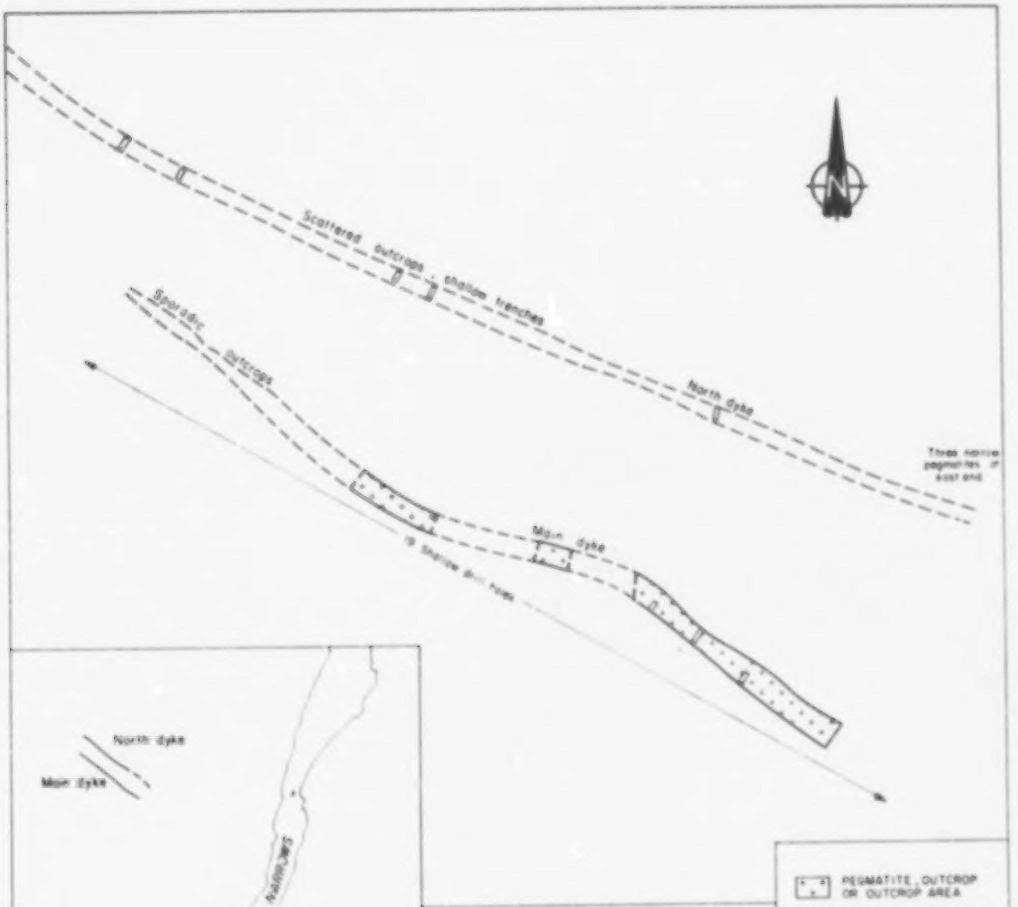

Scattered outcrops - shallow trenches
Sporadic outcrops
North dyke
Three narrow pegmatites at east end
Main dyke
19 Shallow drill holes
North dyke
Main dyke
CROWDUCK BAY NARROWS
South dyke
0 500 m
PEGMATITE OUTCROP OR OUTCROP AREA
PROJECTED EXTENSION
TRENCH OR SHALLOW PIT
0 30 m
Approx. 1100 m at 180° to SE end of Main dyke
Scattered outcrops on trail to Crowduck Bay
South dyke
8 Shallow drill holes

Figure 73: *Spodumene-bearing "Sherritt Gordon" pegmatites.*

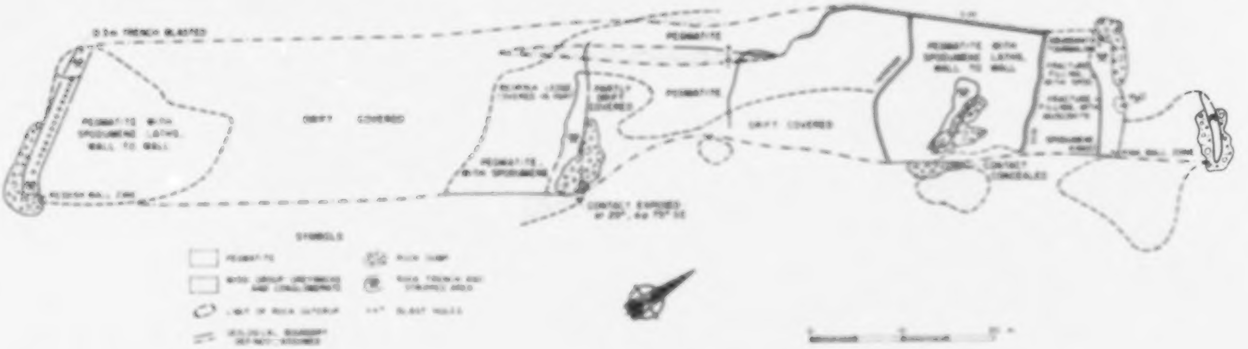

PEGMATITE WITH SPODUMENE LATHS, WALL TO WALL
DRIFT COVERED
PEGMATITE
PARTLY DRIFT COVERED
PEGMATITE, WITH SPODUMENE
PEGMATITE
DRIFT COVERED
PEGMATITE WITH SPODUMENE LATHS, WALL TO WALL
CONTACT EXPOSED
CONTACT CONCEALED
SYMBOLS
PEGMATITE

Figure 74 *Violet pegmatite: plan of outcrup*

Combined Developments Limited: Violet Group

Pegmatite dykes outcrop on the Violet Group, east of the narrows of Crowduck Bay, 6 miles north of east from Herb Lake settlement. Twenty-six holes were drilled by Combined Developments Limited in 1955 to 1956, totalling 2534 m, and a further drill program was completed late in 1956, when the company's assets were acquired by Canadian Scotia Limited. Current holder of the property is G.F. Thompson.

The main Violet pegmatite is intruded almost conformably along a dilational fracture that developed in nearly vertical Missi Group greywacke and conglomerate. It strikes about 30° and dips southeast at a high angle. It outcrops intermittently for 130 m along a ridge located 50 m east of Crowduck Bay (Figs. 72, 74). Several trenches across the dyke expose the "wall-to-wall" distribution of bladed, medium grained greenish spodumene crystals, which show a common alignment (Fig. 75) perpendicular to the contacts of the pegmatite. In some places, interlayering of spodumene-rich bands and quartzofeldspathic pegmatite is well developed (Fig. 76). Composition of the deposit is fairly uniform consisting dominantly of spodumene and K-feldspar, with subordinate albite, quartz, muscovite and some tourmaline.

In the north trench, the spodumene layers are truncated by fractures which strike 25° and dip 75° east. The fractures range from a micaceous coating, to a thin micaceous zone, to fracture zones filled with white K-feldspar with red iron stain and fine grained albite. In places the spodumene layering is distorted to gently curving bands, as seen both in plan and section. At the east wall zone in the north trench, the spodumene crystals are fractured and bent. Red "alteration" of the spodumene crystals is concentrated within a 0.3 to 1 m zone on either side of the fractures.

A concentration of tourmaline crystals occurs over a width of 6 m inwards from the west edge of the north trench, and is within the greenish spodumene + white K-feldspar (with albite laths) + quartz zone. Where the black tourmaline is present as needle-like crystals, it has a parallel orientation to, and in places is intergrown with, the spodumene. Some tourmaline clusters were noted in the wall rock. Within the pegmatite, tourmaline is concentrated in the western half. Ta-Nb minerals were not observed in examination of the outcrops and of all the samples that were collected.

The dyke is divided or split into two dykes on the south side of the north outcrop by a long, narrow septum of greywacke and conglomerate (Fig. 74). The drill results indicate "splitting" occurs at the south end of the drilled interval, and that two separate (or ? offset) dykes with a low spodumene content are present 15.2 m to the west (Fig. 77). A second parallel or offset dyke occurs at the north end of the drilled area; it too has a lower spodumene content.

Tonnage estimates, based on drill results from 1955 to 1957, indicate 5 260 000 tonnes grading 1.2% Li_2O. The dyke has been drilled to a depth of 180 m. Černý et al. (1981) report the analysis of 3 samples of spodumene indicated an average Fe as Fe_2O_3 content of 1.237% (range 1.23 to 1.25%).

Figure 75 *Spodumene crystals (grey) in typical near parallel alignment. Violet pegmatite; hammer head is 15 cm long.*

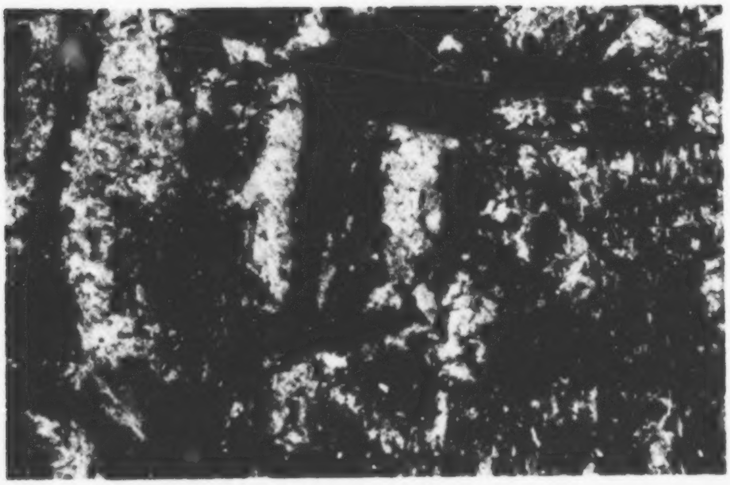


Figure 76: Alternating bands of bladed spodumene and quartzofeldspathic pegmatite, Violet pegmatite; hammer head is 15 cm long.

Pegmatite on south part of Violet group

A pegmatite dyke 1 to 3 m wide, outcrops for 25 m along the slope of a steep rock ridge along the east shore of Crowduck Bay, south of the creek on the Violet group (Fig. 72). The dyke intrudes metasediments which strike at 25°; the dyke strikes 30° and dips about 80° southeast.

At the north end, where the dyke is 0.9 m wide, it consists of fine- to medium-grained quartz + yellowish muscovite + tourmaline. The dyke is 3 m wide 15 m from the north end; the western 2.4 m consists of fine- to medium-grained pink albite + quartz + muscovite, in sharp contact with a spodumene zone along the east side of the dyke. The spodumene is pale green and occurs either in clusters of coarse blades, up to 5 cm long, or as diversely oriented blades.

The dyke is contorted north of its pinch-out, 25 m south of the north end. The western contact strikes 40° and dips 67° southeast; the eastern contact strikes 33° and is nearly vertical. Mica is concentrated along the contact. Some aplite, as well as pink perthite megacrysts, are present. The pinch-out of the pegmatite is exposed.

Another exposure of pegmatite occurs along the steep cliff face, 9 to 12 m south of the above-noted pinch-out and 6 m above the water level. Light greenish spodumene blades, 12 to 18 mm long, occur in clusters. The spodumene has been distorted by both bending and fracturing.

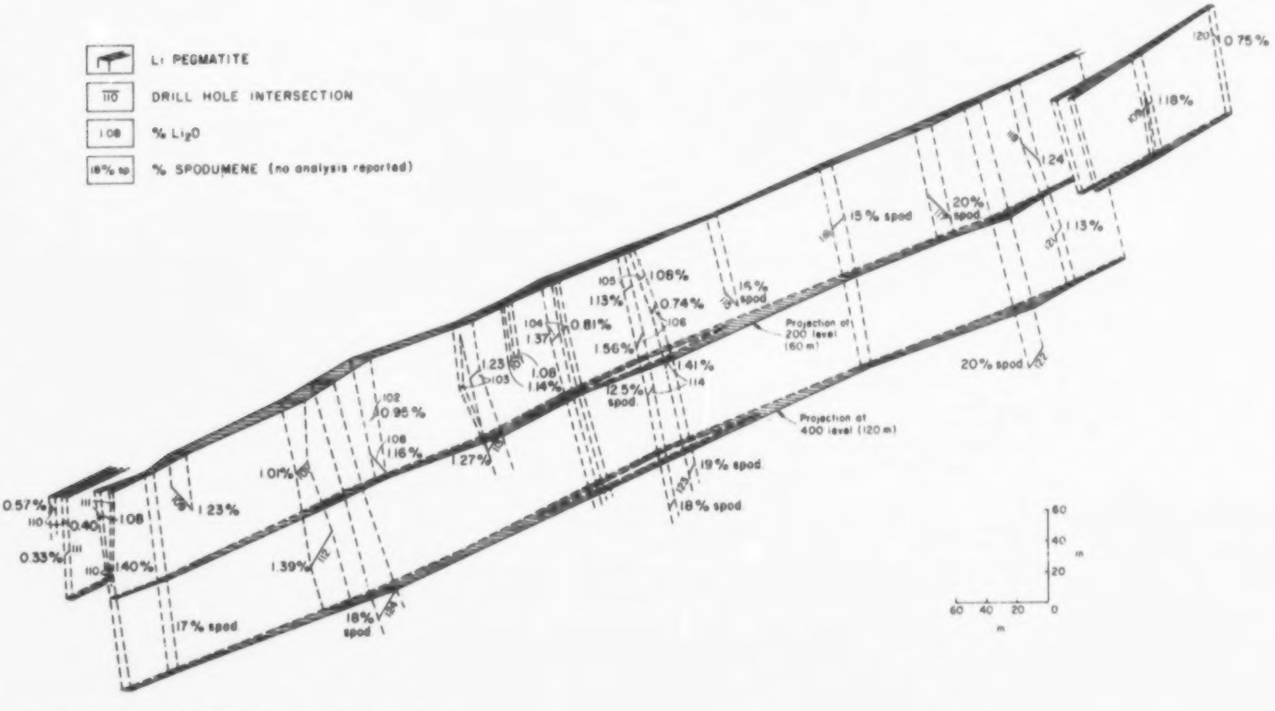

Li PEGMATITE
110 DRILL HOLE INTERSECTION
1.08 % Li$_2$O
18% sp % SPODUMENE (no analysis reported)
0.57%
110
0.40
108
0.33%
110
1.40%
1.23%
1.01%
1.39%
112
17% spod
18% spod
102
0.95%
108
1.16%
1.27%
1.23
103
1.08
1.14%
104
1.37
0.81%
105
1.13%
1.08%
0.74%
106
1.56%
1.41%
114
12.5% spod
19% spod
123
18% spod
15% spod
Projection of 200 level (60 m)
Projection of 400 level (120 m)
15% spod
20% spod
1.24
1.13%
20% spod
1.18%
120
0.75%
60
40
20
0
m

Figure 77: Violet pegmatite: drilling results.

Green Bay Mining & Exploration Limited: Lit Group

One large spodumene-bearing pegmatite, and several smaller ones, outcrop north and northeast of a small lake located 5 km slightly north of east from the narrows of Crowduck Bay. The deposit can be reached via a winding trail that starts on the east shore of Crowduck Bay, 4 km north of the narrows (Fig. 72). The property was staked in 1954 and 1955 by J.J. Johnson and J.A. Syme. In 1956 Green Bay Mining & Exploration Limited completed 6000 m of drilling. The history of ownership and exploration is described in detail on Mineral Inventory card 63J/13 Li 1, in Bamburak (1980).

Main dyke, Green Bay property

The main spodumene-bearing dyke outcrops along the west side of a rock ridge, 4.5 to 6 m high, and is exposed in 16 shallow trenches within a distance of 90 m (Fig. 78). The trenches are generally perpendicular to the contacts. Both contacts of the dyke are exposed. On the west side, at the north end, the pegmatite is in contact with quartzose metasediments. To the east, amphibolites are exposed, and the pegmatite transects their foliation. The dyke strikes 0°, curving to 345° at the north end; it is vertical. The dyke is about 15 m wide at the north end, and broadens to 25 m or more in the central part of the trenched area.

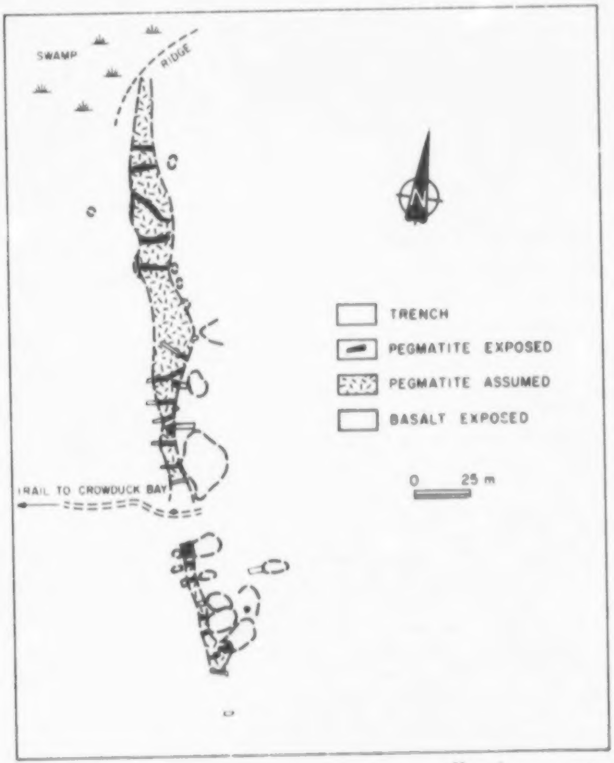


Figure 78: Green Bay main pegmatite (from Černý et al., 1981, Fig. 164).

In general, the dyke is a pink feldspathic pegmatite with a low quartz content (up to 5 per cent). Coarse books of yellow muscovite occur with spodumene, albite, K-feldspar, tourmaline, quartz and minor beryl. Black tourmaline is abundant as fine grained crystals in the eastern wall zone, and occurs also as coarse crystals in the central part of the dyke. Some very coarse grained pink microcline-perthite megacrysts occur in the central part of the dyke, and tourmaline is associated with them. Many parts of the pegmatite have only a small amount of quartz, and no concentrations of quartz were noted.

Spodumene occurs as coarse, pale greenish bladed crystals, either in clusters, over widths of 6 m or more, or associated with coarse tourmaline and perthite megacrysts. Some spodumene crystals show a preferred orientation of 45° to 55°. The spodumene is characterized by minute to 2 mm specks of pyrite, which, on the weathered surface, are surrounded by halos or patches of red and yellow iron stain. In one place, 3 m in from the eastern contact, the spodumene is altered to a soft green product (which is in contact with glacial drift). Some spodumene crystals are up to 35 cm long.

A few small crystals of white beryl anhedra were noted in the wall zone. Spodumene-bearing pegmatite is exposed in trenches to the south of the main outcrop. Either the dyke splits into two segments, or two parallel pegmatites are present there. The eastern dyke is narrow and irregular, consisting of feldspars + yellow muscovite + quartz + tourmaline.

The western dyke is 5.2 m wide and contains abundant spodumene; it strikes 340°, and is vertical. Pods of diversely oriented pale green bladed spodumene crystals occur within 30 cm of the eastern contact. The pods are up to 33 cm across. The spodumene crystals occur in bands, somewhat similar in texture to the Violet pegmatite. Away from the pods, the dyke is virtually barren of spodumene, and contains pink K-feldspar megacrysts which have a white weathered surface. Tourmaline is fairly abundant, especially near the west contact. Some minor beryl was noted in this trench.

The drilling has outlined reserves of 1 815 000 tonnes, grading 1.4% Li_2O, on the property according to one report; however, numerous ore reserve figures have been published (see Mineral Inventory card noted above).

Other dykes, Green Bay

Mulligan (1957) reported that 6 other pegmatites occur in this area, within a zone extending 2150 m [7,000 feet] N55°E from the main dyke. These other dykes have various northwesterly strikes but "They are generally quite erratic in strike and in width, broken by cross-shears, and locally split into networks among greenstone inclusions. Several may be gently-dipping bodies. Coarse grained spodumene is abundant in some lenticular bands and fine grained spodumene is distributed through some aplitic patches. A considerable additional tonnage of mineable material is probably available, but not in any single large body. A good deal of stripping and trenching and some diamond-drilling has been done on the other dykes, which are exposed for lengths up to 800 feet." Beryl was observed in two of the other dykes. A detailed map of these dykes is not available, and the spodumene-bearing northeast dykes were not examined in the present study.

One small irregular beryl-bearing dyke was observed about 400 m northeast of the campsite at the main dyke. Two crystals, 6 mm across, of yellowish beryl occur in a quartz + pink K-feldspar + muscovite + tourmaline pegmatite, cutting dark metasediments.

GRANVILLE LAKE BERYL PEGMATITE

A pegmatite dyke containing beryl was located by D. Cranstone, during mapping of the Watt Lake area (Fig. 79) (Cranstone, 1968; Locality 5). He described the dyke, which is exposed for a length of 30 m (Mulligan, 1968) as follows:

> "A pegmatite dyke containing beryl was found by the writer in August, 1961, on the south side of an island in Granville Lake, near the south boundary of the map-area. Beryl has not previously been reported from the Lynn Lake or Granville Lake areas.
>
> "The dyke is 16 feet (4.9 m) wide, and cuts Sickle arenites. It consists of a coarse graphic intergrowth of microcline-perthite and quartz, with scattered books of muscovite up to 2 inches (5 cm) across, and minor biotite. It strikes S55°E and was exposed only because of the low water-level of Granville Lake during August, 1961. The pegmatite contains a few red-brown garnet crystals and small disseminated grains of a hard grey metallic mineral, which yields a red powder when crushed and might be cassiterite. Scattered, irregularly shaped quartz lenses in the core zone of the dyke are about one foot wide, and contain hexagonal crystals of beryl, apatite, and tourmaline, as well as small books of a pale greenish yellow mica. Beryl crystals are well formed, pale yellow-green in colour, up to 2 inches (5 cm) across and 6 or more inches (15 or more cm) long. Black euhedral tourmaline crystals are up to 3/8 inch across and 3 inches long (0.9 cm across and 7.5 cm long). Apatite crystals are well formed, blue-green in colour and up to ½ inch (1.3 cm) across.
>
> "It is doubtful that the beryl content of the dyke is sufficient to be of economic value. However, numerous large and small pegmatite intrusions exist in the Watt Lake area, and prospecting of these for beryllium and lithium minerals and other minerals of pegmatitic association is suggested" (Cranstone, 1968).

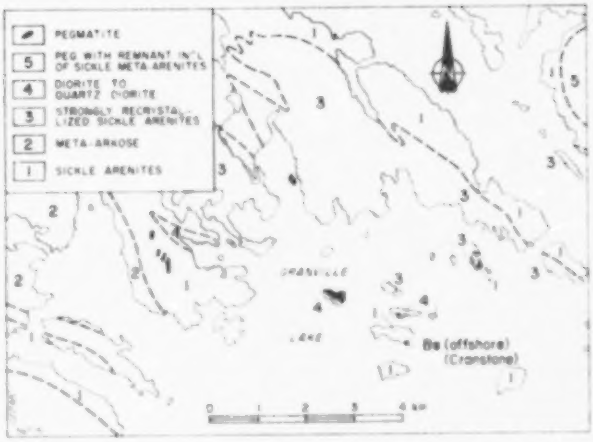

PEGMATITE
5 PEG WITH REMNANT IN'L OF SICKLE META-ARENITES
4 DIORITE TO QUARTZ DIORITE
3 STRONGLY RECRYSTALLIZED SICKLE ARENITES
2 META-ARKOSE
1 SICKLE ARENITES
GRANVILLE
LAKE
Be (offshore) (Cranstone)
0
1
2
3
4 km

Figure 79. *Granville Lake beryl-bearing pegmatite (from Cranstone, 1968).*

The pegmatite was under water when the locality was re-examined by geologists of the Geological Services Branch in both 1981 and 1982 (M. Cameron and P. Lenton, pers. comm.). Cameron noted a minor amount of yellow beryl in other, small pegmatites transecting meta-arkose, 400 m west of Cranstone's pegmatite and on the same island. A small concentration of beryl crystals was noted near the quartz core of the largest of these tourmaline-rich pegmatites, but the occurrences are considered to be non-economic.

PEGMATITES OF THE CROSS LAKE AREA

Rare-element pegmatites were reported by Bell (1962), and by Rousell (1965) on several islands in the southwestern part of Cross Lake (Fig. 80). All the dykes intrude metasediments: sandstone, arkose, conglomerate and metamorphosed equivalents. Two parallel dykes outcrop on Metis Island, south of Cross Island, and contain large crystals of spodumene, as well as some beryl. Seven other dykes are fairly small and irregular; beryl is the only rare-element mineral in them. (Recent work on the Cross Lake pegmatites is described below)

Cross Lake spodumene pegmatites

The major dykes reported by Rousell (1965) are two parallel pegmatites outcropping at about the midpoint of the south shoreline of Metis Island and west of the main channel of Nelson River (Fig. 80). The dyke was staked prior to 1959, (possibly as part of the Liz group) and has been trenched.

The pegmatites intrude greywacke and conglomerate, which contain abundant clusters of radiating black tourmaline needles along the

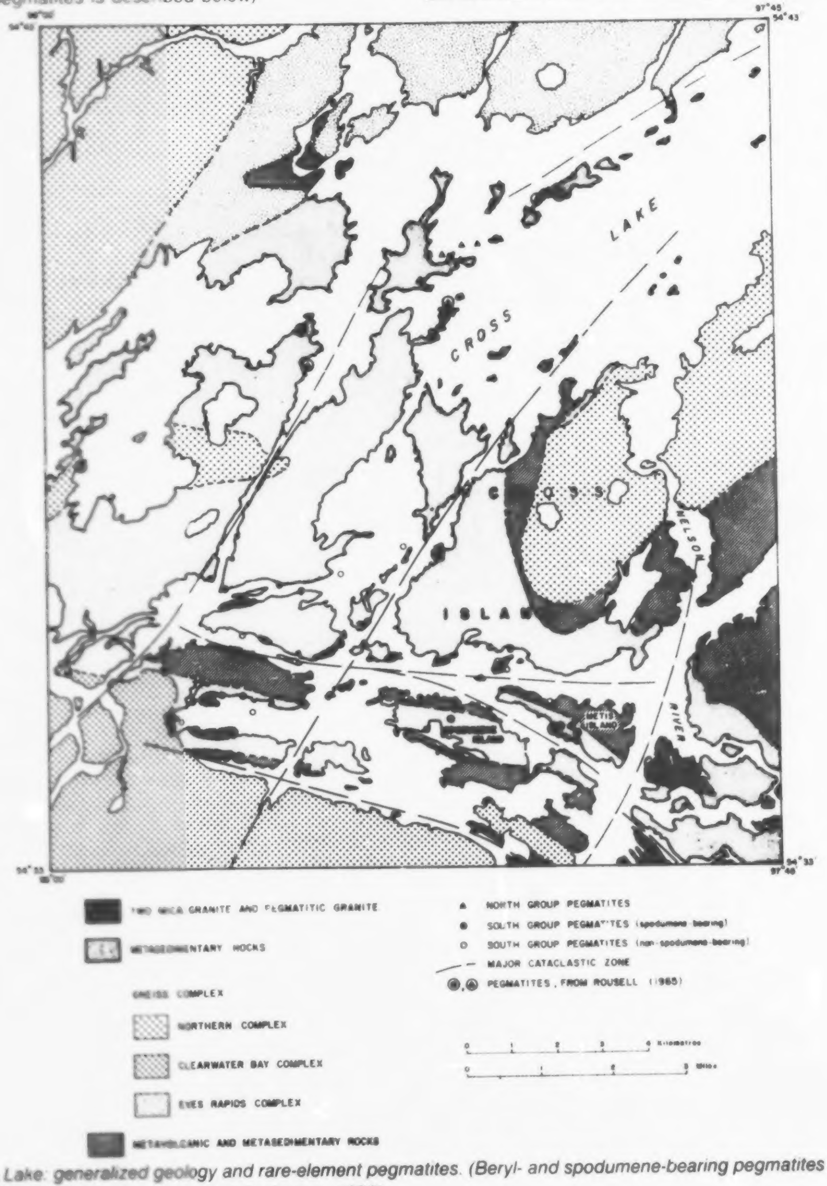

97°45'
54°43'
54°33'
97°45'
CROSS LAKE
CROSS ISLAND
NELSON RIVER
METIS ISLAND
TWO MICA GRANITE AND PEGMATITIC GRANITE
METASEDIMENTARY ROCKS
GNEISS COMPLEX
NORTHERN COMPLEX
CLEARWATER BAY COMPLEX
EVES RAPIDS COMPLEX
METAVOLCANIC AND METASEDIMENTARY ROCKS
▲ NORTH GROUP PEGMATITES
● SOUTH GROUP PEGMATITES (spodumene-bearing)
○ SOUTH GROUP PEGMATITES (non-spodumene-bearing)
MAJOR CATACLASTIC ZONE
PEGMATITES, FROM ROUSELL (1965)
0 1 2 3 4 Kilometres
0 1 2 3 Miles

Figure 80 *Cross Lake: generalized geology and rare-element pegmatites. (Beryl- and spodumene-bearing pegmatites denoted O, from Rousell, 1965, remainder from Lenton and Anderson, 1983).*

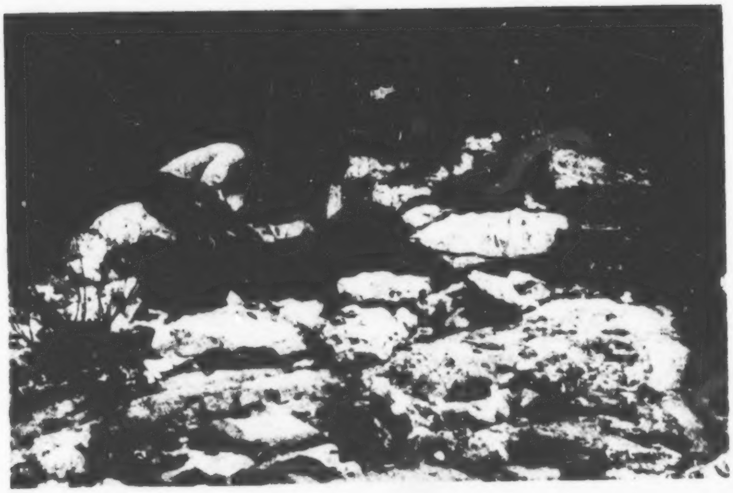


Figure 81: *South contact of spodumene-bearing pegmatite, Metis Island, Cross Lake.*

contact. The pegmatite strikes 75° and dips irregularly from about 70° to 45° to the north; it is discordant. It is well exposed in irregular surface trenches (Fig. 81), and outcrops over a length of at least 9 m eastward from the shoreline. It is covered by overburden to the east. A section was measured from north to south across the dyke in the one place where the dyke appears to be nearly vertical:

13 cm	Wall zone
60 cm	Coarse grained pink perthite + quartz + muscovite, with minor tourmaline, spodumene, beryl. Some white albitic aplite.
60 cm	White cleavelandite + quartz + muscovite + tourmaline.
70 cm	Coarse pink perthite + quartz + spodumene (pale greenish-white bladed crystals), minor tourmaline in clusters on north side; grades southward to medium grained white albite-oligoclase + spodumene + quartz.
45 cm	Medium grained white albite + quartz + spodumene.
30 cm	Medium grained pink microcline-perthite + muscovite + quartz.
33 cm	Abundant very pale greenish to white spodumene in crystals showing excellent pyroxene-type cross-sections, 1 cm to about 20 cm long; interstitial massive quartz; muscovite books, accessory black tourmaline; minor uraninite, tapiolite and cassiterite; pink garnet.
13 cm	Wall zone. Fine grained albite + muscovite + quartz + tourmaline + blue apatite.

The pegmatite has a tourmaline-rich contact zone with metasediments. In places in the dyke, veinlets of albite and apatite cut pink microcline-perthite. The tapiolite was identified in early X-ray work (Bannatyne, 1974).

A second, parallel dyke is located about 11 m to the north of the main dyke. It is 2.1 m wide and contains patches with numerous white beryl crystals about 12 to 25 mm aross. The pale greenish-white spodumene is well crystallized. Tourmaline and blue apatite are present, and along the north contact orange-stained bands and layers of quartz are present. Some white K-feldspar and minor Ta-minerals are present.

L. Solkoski saw these dykes again in 1977, at a time of low water, and reported that the two dykes continued downslope and joined to form a narrow dyke that pinched out to the west. Another dyke, containing beryl, was exposed on the south shore of the island, about 100 m east-southeast of the main outcrop. Since that time, numerous additional pegmatites have been discovered on the islands in Cross Lake, many of which are exposed only during periods of low water level.

Cross Lake area: recent work, 1980-1983

The area around the previously described pegmatites has recently been explored and drilled by Tantalum Mining Corporation of Canada Ltd., who financed in 1981 and 1982 a sampling program by P. Černý and a thesis study by A.J. Anderson at the Department of Earth Sciences, University of Manitoba. Recently, the Mineral Resources Division sponsored additional work by P. Černý on the "Preliminary strategic minerals evaluation and geochronological project", and began a detailed mapping program of the area (Corkery and Lenton, 1983) and an investigation of rare-element pegmatites (Lenton and Anderson, 1983). The latter is a co-operative program between the Mineral Resources Division and the University of Manitoba as part of the 1983-1985 Federal-Provincial Interim Mineral Agreement.

The above work has resulted in the discovery of about 90 previously unreported pegmatites in the Cross Lake area, many of which contain rare-element minerals. The pegmatites occur in two belts: a northeast-trending belt that contains Be and Ta-Nb mineralization, and a southern east-west belt that contains Li, Ta-Nb, and minor Be mineralization. Studies to date (Černý, 1983, Anderson and Černý, 1982, and Lenton and Anderson, 1983) have indicated that fractionation trends increase to the northeast and east within the two belts. An updated map of pegmatite occurrences is shown as Figure 80. Ta-Nb mineralization has been found at six localities. Anderson (in Černý, 1983), states, "Columbite-tantalite occurs as tabular and wedge-shaped grains between 0.1 and 5.0 cm in length, in cleavelandite and fine grained albite. The Mn/Fe and Ta/Nb ratios in columbite-tantalite increase with progressive pegmatite fractionation . . . These initial chemical results indicate that the eastern group of pegmatites are of considerable economic interest and therefore deserve detailed exploration." Many of the spodumene-bearing pegmatites are intruded into massive and pillowed metabasalt, especially on Spodumene Island (P. Lenton, pers. comm., 1984).

LAKE 'J' (McLAUGHLIN LAKE) PEGMATITE, OXFORD LAKE AREA

Barry (1959, p. 37) reported a spodumene-bearing pegmatite concordantly intruded into metasediments 13 km southeast of Oxford Lake and 11 km southeast of Knee Lake. It is located at 54°46'N latitude, 95°12'W longitude, on Lake 'J' as shown on Barry's map 58-3A, and in this report in Figure 82. The dyke is located about 300 m north of a metasediment-granite gneiss contact. The Lake referred to by Barry is now named McLaughlin Lake (P. Gilbert, pers. comm., 1984).

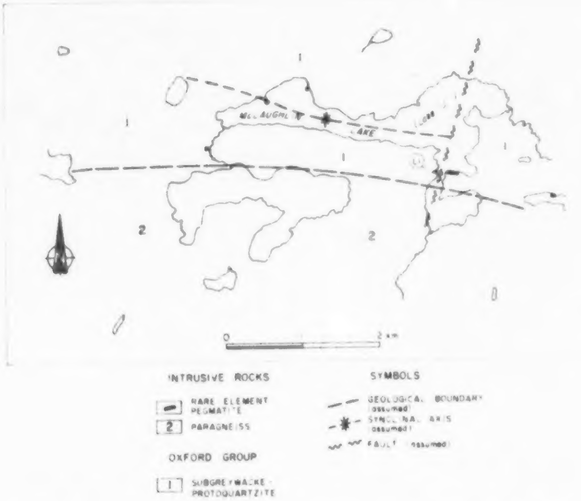


Figure 82: *McLaughlin Lake (Lake 'J'): Oxford House area (geology from Barry, 1959).*

The dyke was examined on the west shore of the southern bay of the lake. There the dyke strikes generally 100° and is vertical. The thickness varies along strike, being 155 cm at the lake shore, 120 cm about a metre to the west, then widening to 220 cm 8 m west of the shore, although an inclusion of metasediments is present in the central part of the dyke. The pegmatite pinches and swells along strike, and Barry (1959) reported a length of 400 m. The spodumene is concentrated towards the northern part of the dyke, particularly in the wider parts. One section was measured across the dyke from south to north.

Wall rock

South contact: exposed, vertical

1.3 cm Border zone: aplite, with black tourmaline crystals to 6 mm

29 cm Grey and white K-feldspar, with quartz

115 cm Spodumene: both as fine grained pale greenish-grey bladed crystals, with quartz, oligoclase and K-feldspar, and as flat, greenish, stubby crystals, which are probably primary (Fig. 83). Quartz content is low. Spodumene is concentrated towards the north contact; one crystal is 35 cm by 7 cm. Garnet is an accessory.

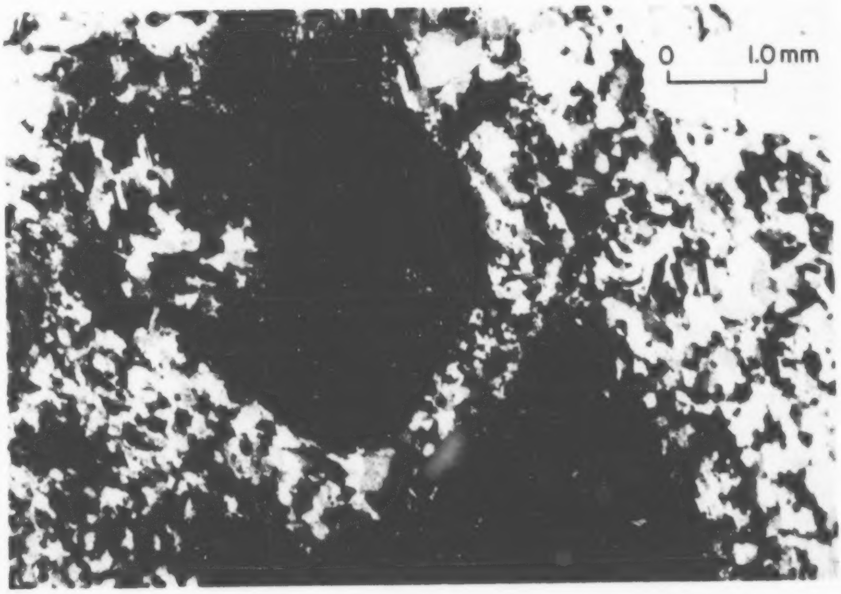
14 cm Albite-quartz

1.3 cm Border zone: chilled margin

North contact: exposed, vertical

Wall rock

Figure 83: *Cross-section of primary spodumene crystals in fine grained quartz-albite matrix; very fine grained quartz + mica in veinlets and fringing the spodumene; McLaughlin Lake pegmatite.*



The spodumene crystals are diversely oriented. Some are a fairly translucent green. Spodumene forms up to 40 per cent of the dyke in several places. Many of the spodumene crystals are stubby, showing a slight radiating habit within crystals. They break easily into small columnar pieces.

The pegmatite is exposed in a smooth rounded outcrop which has not been trenched, and thus is difficult to sample. Outcrops to the west of the lake include muscovite, in books up to 18 mm in diameter. Accessory minerals include garnet and blue apatite.

The dyke is also exposed on the point due east across the southern bay of Lake 'J'. Barry's 1959 map indicates a fault striking south down this bay toward the pegmatite, but there appears to be no lateral offset of the pegmatite. The total length of the pegmatite is not known.

In a second report, Barry (1962) reported additional details of this occurrence. A channel sample, taken across the dyke at the lake shore, assayed 1.32 per cent Li_2O over a width of 1.52 m. A second dyke was noted: "Approximately 65 feet west from the shore of the lake and several feet south of the main dyke, a spodumene-bearing pegmatite transgresses the foliation of the rocks. This exposure was traced for a length of 42 feet and varies in width from 2 inches to 4 feet. Two representative grab samples assayed 2.87 and 0.98 per cent Li_2O." Barry further reported that "On the east shore of the lake, the pegmatite is up to 3 feet wide and extends 30 feet to the east where it disappears under overburden. The pegmatite was not observed 400 feet to the east, along the strike, where outcrop coverage is good. This pegmatite has the same mineralogical composition as, but is finer grained than, its extension on the west shore of the lake."

PEGMATITES OF THE RED SUCKER LAKE AREA

Bateman (1943) reported the discovery of cassiterite in aplite dykes at Red Sucker Lake.

"Late in the summer of 1928, cassiterite was discovered at Red Sucker Lake by Raehill, Cowan, and Wass in an albitite dyke on the north shore of the lake. In 1940, the Tin Bar group was staked, a second dyke was discovered. In 1943, the property was optioned to Gods Lake Gold Mines.

"The following description is based on the reports of representatives of the mining companies.

"The original discovery is in an area of albitite 25 x 20 x 15 feet on the shore of the lake. The albitite is a fine grained friable rock, light buff in colour, and sparingly sprinkled with small, black cassiterite crystals. The rock is composed almost entirely of albite, but in some places it contains small amounts of quartz, foils of muscovite, and traces of topaz and indicolite. Two channel samples over a width of 6 feet are reported to have averaged 0.42 per cent tin."

A report on file at the Manitoba Mineral Resources Division, dated 1942, states:

"Claims have been staked about three small dykes of albite aplite. The dimensions of the dykes where exposed were given as 20 feet x 6 feet, 8 feet x 1 foot, and a pipe-like mass 3 feet in diameter. The tin occurrence was confined to two narrow bands 3 to 5 inches in width in one of the dykes. Crystals of cassiterite up to 1/8 inch in size were sparingly distributed .... Samples taken where cassiterite showed in the dyke yielded .56 and .38 per cent cassiterite."

In 1943 it was reported that 915 m of diamond drilling was completed prior to September 1st, 1943. Although cassiterite was reported to be not uncommon in the area, the amount encountered was nowhere considered to be of ore grade. Two showings "on an aplite dyke on one claim, and a pegmatite dyke on another, were prospected .... Nowhere was there any great depth of cassiterite." A vein with visible gold was noted in an occurrence near the main aplite dyke. Also reported was the occurrence of "lepidolite, spodumene, and amblygonite in a matrix of quartz, muscovite, tourmaline (black and green) and apatite." These occurrences are apparently small, and without cassiterite. One pegmatite, trenched over a width of 16 m to a depth less than 0.3 m, was reported to contain a few bands of lithium minerals ("Either amblygonite or spodumene or both") along the footwall side.

In 1973, the albitite dyke on the lake shore, described by Bateman (1943) was located. The albite aplite dyke outcrops along the north-facing slope of a rock ridge on the south shore of a small bay near the west end of the old Tin Bar group (Fig. 84). The dyke strikes 115° and appears to be vertical. A band of metavolcanics within the dyke parallels the contact, which is slightly undulating. The dyke extends only 1.8 m above the water level, but can be seen to extend offshore, the north contact was not visible. The exposure is triangular in shape, and along the eastern contact, striking 175°, the dyke consists of a medium grained zone of quartz + feldspar(albite) + tourmaline + muscovite.

Small red garnets occur in clusters. Blue apatite occurs disseminated through the aplite in grains up to 6 mm across.

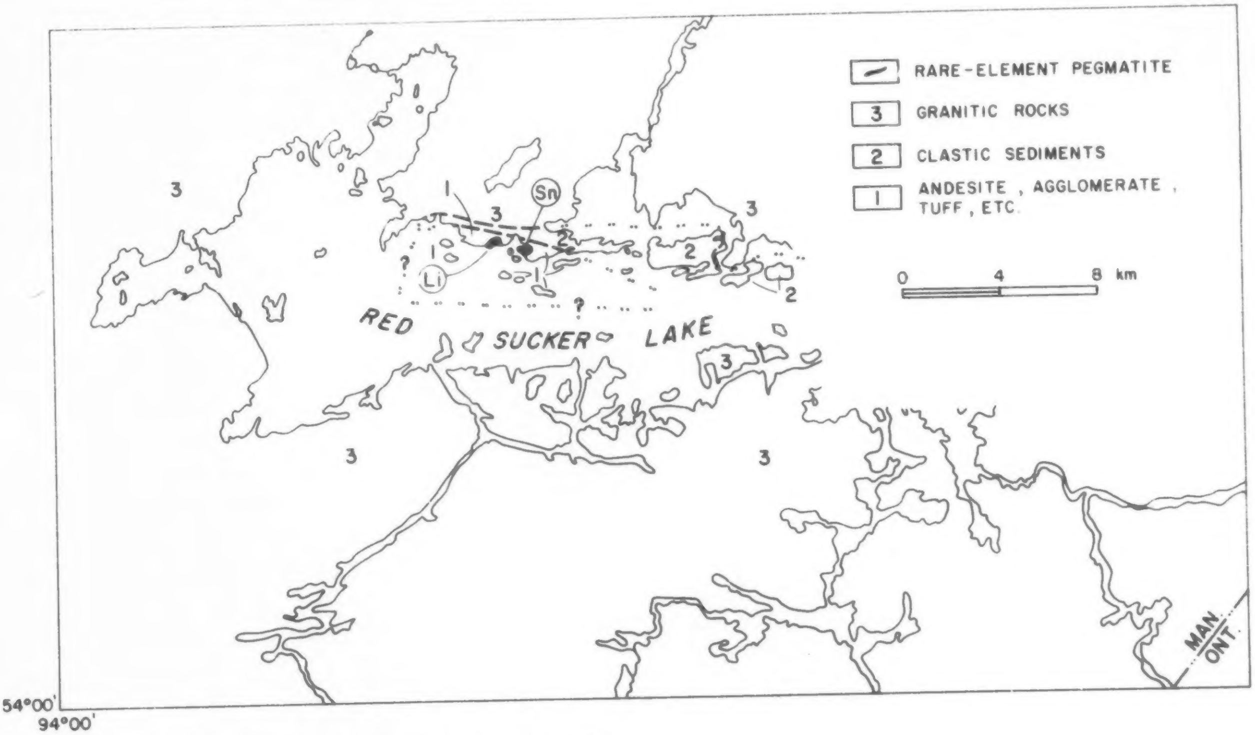


Figure 84: Red Sucker Lake area (geology from Downie, 1936).

Blasting has broken off pieces of the dyke along the shore, and it was in one of these blocks that the richest concentration of small cassiterite crystals was noted (Fig. 85, 86). The distribution of the cassiterite is very spotty. Some areas of the dyke are barren. It appears to be concentrated as clusters of small crystals, about 1 to 2 mm, near the contacts of the dyke, associated with larger crystals of tourmaline.

Other dykes reported in the area could not be located during a brief reconnaissance.

Exploration in 1981 has confirmed the occurrence of spodumene-bearing pegmatite on this claim group (D. Trueman, pers. comm.), on the point of land across the bay to the west of the cassiterite showing described above.

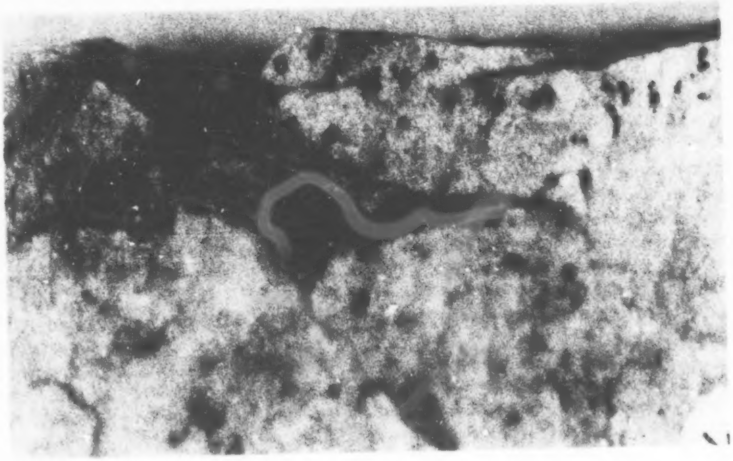


Figure 85. *Saccharoidal albite with disseminated cassiterite crystals, Red Sucker Lake.*

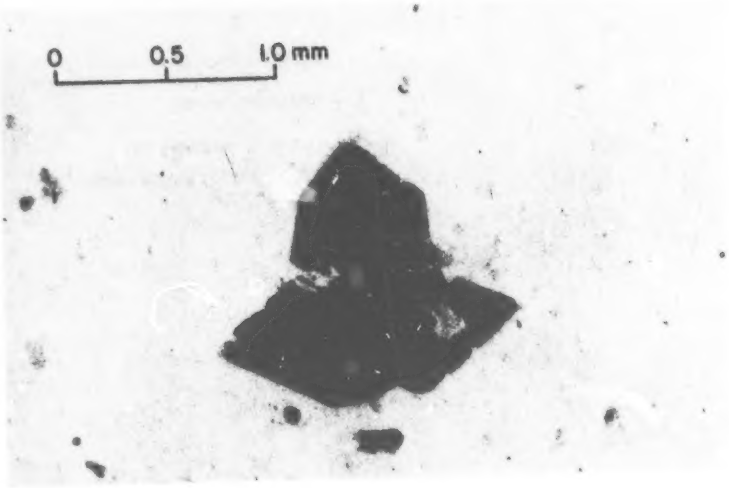


Figure 86: *Twinned crystals of cassiterite in a matrix predominantly of fine grained albite, with minor quartz and apatite; Red Sucker Lake dyke.*

PEGMATITES OF THE RED CROSS LAKE AREA

A unique pegmatite swarm containing rare-element minerals outcrops near the northeastern end of Red Cross Lake. The deposit consists of about 17 thin, parallel, conformable dykes that were discovered by Potter (1962), who noted the occurrence of a purple mica with a high rubidium content. A description of the structure and mineralogy of the deposit has been published by Jambor and Potter (1967). The area was mapped also by Barringer Research Ltd. in 1971 (V. Sopuck, ESS file 91808). The four largest dykes were sampled by the writer in 1973, and later mineralogical studies showed the occurrence of small grains of pollucite in one dyke.

The dykes outcrop down the slope of a rock ridge extending 1.8 m above lake level, along the northwest corner of a point near the east end of the lake (Fig. 87). The dykes have been trenched and are well exposed for 15 m inland from the shore. Jambor and Potter (1967) indicated a combined thickness of about 9 m of dyke material over a width of about 53 m. The dykes are intruded into basic metavolcanics and tuffaceous rocks of the Oxford Group. The Red Cross Fault, a regional structure, is present to the south of the dyke, and a north-south fault is located immediately west of the pegmatites.

The widest dyke near the west end was measured as 33 cm wide, with a strike of 295° and a dip of 76°S. The weathered surface is white, and exhibits a streaked out, finely banded to mylonitic structure. Streaks of dark glassy quartz occur, as well as spots and streaks of purple mica. The dyke contains septa of metavolcanics.

The second major dyke is 150 cm wide, and has an irregular contact on its west side. The dyke has an extremely finely banded appearance (Figs. 88, 89) and in places the banding is contorted. The texture varies from chert-like or aphanitic to finely crystalline; a few grains up to a few mm in size are scattered through the dyke. Along the eastern contact, a slight degree of truncation of the wall-rock foliation was noted. Thin sections show segregation of the purple mica into thin stringers alternating with quartzofeldspathic material (Fig. 88). The banding is slightly offset in places by fractures. Small glassy grains noted in a hand specimen from this dyke were identified as pollucite by X-ray powder photograph (J. Macek and L. Solkoski) in 1974. Small grains of spodumene were noted in thin section.

Farther northeast, a third dyke shows abundant purple mica. The dyke dips slightly to the south, but is perfectly conformable on the southwestern contact. It is 51 cm wide, including a central 10 to 15 m septum of wall rock which pinches out part way down the slope of the outcrop ridge. The northeastern part of the dyke is mainly a very fine grained quartzose material. The northeastern contact has micaceous material developing along it, and it transects the schistosity of the wall rock at a low angle.

Farther northeast again, the widest dyke, corresponding to the "12-foot dyke" of Jambor and Potter, was measured at 270 to 330 cm wide along the shore; it extends northwest and appears to broaden offshore. Eight metres back from the shore, the dyke narrows to 180 cm, and a further 9 m back, it is 150 cm wide. The banding in this dyke differs from those previously described. The dyke includes septa of wall rock, and has light coloured 6 to 12 mm contact zones along each septum. White aplite is present along the eastern contact. Next is a 30 cm-wide purplish well banded dyke in which the bands are 6 to 12 mm wide. Towards the centre the purple bands alternate with pinkish translucent, predominantly quartzose bands; usually 4 to 8 purplish bands occur in each 5 cm width (Fig. 89). Banding is not evident in the western part of the dyke.

Jambor and Potter (1967, p. 2) noted, "Although pollucite was not observed in thin sections, the high content of one analysis (for cesium) indicates that the mineral may be present." The sample was from "margins of the 12-foot dyke" and contained 2.86% Cs_2O.

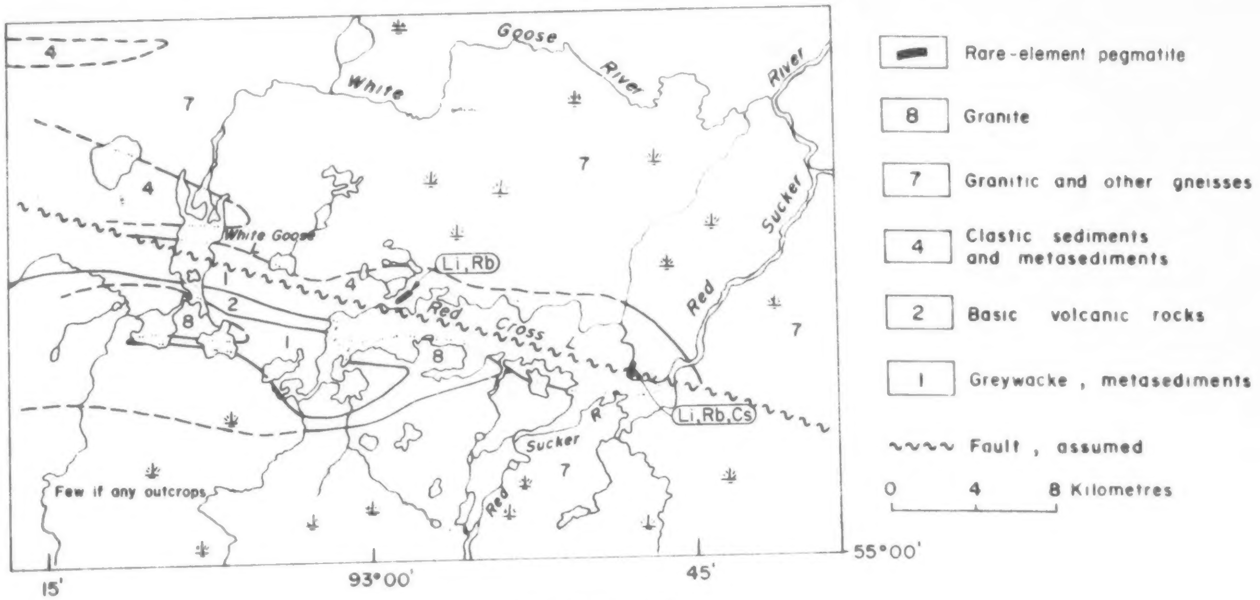


Figure 87: Red Cross Lake area: regional geology (after Potter, 1962).

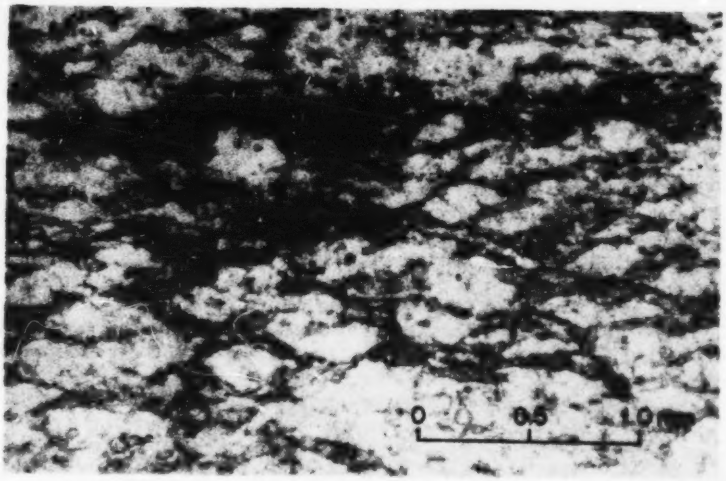


Figure 88

Stringers of Li-mica parallel to dyke contacts, with albite + K-feldspar + quartz; the mica is a major constituent; Red Cross Lake sheared pegmatite.

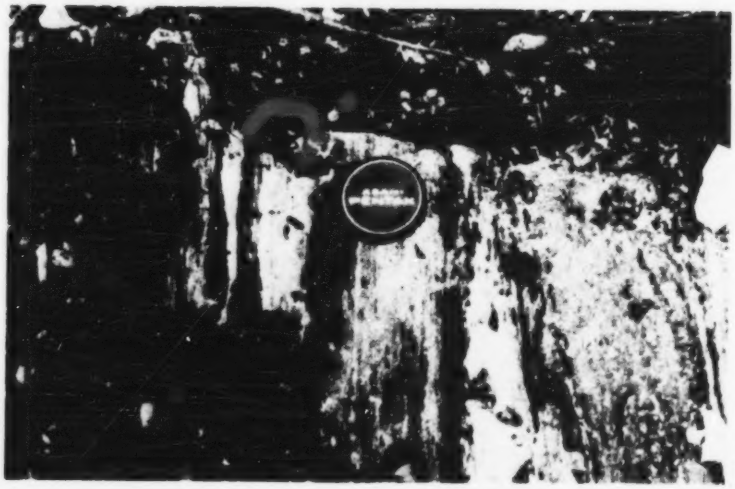


Figure 89

Outcrop of sheared pegmatite, Red Cross Lake; bands with rubidium-rich muscovite and lepidolite alternate with quartzofeldspathic layers; lens cap is 54 mm in diameter.

A notable feature of the dykes is the high rubidium content of the purple mica. A concentrate of "muscovite-lepidolite" consisting predominantly of 2M$_1$ muscovite and some 2M$_2$ polymorph of lepidolite, analyzed by Jambor and Potter (1967) showed:

SiO_2	49.75%	Na_2O	0.18
TiO_2	0.04	K_2O	7.37
Al_2O_3	26.87	Rb_2O	4.53
Fe_2O_3	0.52	Cs_2O	1.00
MnO	0.65	F	4.35
MgO	0.23	H_2O	2.80
			101.32
		O=F	1.83
		Total	99.44%

A semi-quantitative spectrographic analysis by W.F. White (op. cit., p. 5) indicated 0.33%B, 0.0024%Be, 0.1% Ca, 0.026%Sn, 0.0069%Cu, 0.002% Ba, and 0.051%Sr.

The dykes were formed from intrusions that have reached a high level of chemical fractionation, and were subsequently subjected to strong shearing stress.

Other dykes

Additional pegmatites are reported by Barringer Research Limited 1.5 to 2.5 km to the southeast on either side of the outlet of Red Sucker River (Fig. 87). These were reported as a granite-pegmatite complex over a length of 610 m.

Other pegmatites, with spodumene and beryl, are reported by Jambor and Potter (1967):

> "Three closely spaced dark grey pegmatite dykes each about 2 feet (0.6 m) wide, intrude metamorphosed sedimentary rocks on the southeast side of a small lake one mile north of Red Cross Lake (Fig. 87). The dykes contain quartz, K-feldspar, sodic plagioclase, and spodumene. The spodumene averages less than 2 mm in size and is generally very fine grained due to deformation within the dykes. A few grains of beryl were also identified, but mica is virtually absent."

A chemical analysis of a grab sample indicated 2.97% Li_2O (op. cit.).

Other pegmatite dykes occur in the area between Gods River and Red Cross Lake (Potter, 1962), and columbite was reported (Jambor and Potter, 1967) in small amounts in pegmatite that contains dark blue tourmaline.

OTHER PEGMATITES, NORTHERN MANITOBA

Numerous occurrences of rare-element minerals in pegmatite or pegmatitic granite have been reported in the geological literature. Some of the better-documented ones are described below. These include deposits that range from mineral occurrences (e.g., tantalite at Cuthbert Lake, allanite at Bigstone River, etc.) to major pegmatites (e.g. BIL Group) for which little information is available.

The deposits described are:

A. Superior Province
1. Little Playgreen Lake: molybdenite
2. Gorman Lake: tantalite-columbite, molybdenite
3. BIL Group, Gods Lake: spodumene, beryl
4. Bear Lake area: columbite-tantalite; allanite
5. Cuthbert Lake: tantalite

B. Churchill Province
1. Wolf Rapid: molybdenite
2. Southern Indian Lake: molybdenite
3. Veal Lake: uraninite, molybdenite

The general location of these pegmatites is shown in Figure 71.

A). Superior Province

Little Playgreen Lake

Dowling and Tyrrell (1900, p. 16G) report:

"Near north end of Little Playgreen Lake, just below where the Nelson River flows from it, the granitite is cut by some veins of red pegmatite, in some of which are many rounded crystal aggregates of molybdenite, with occasional crystals of pyrite and magnetite."

Gorman Lake

Derry and MacKenzie (1931, p. 14) reported, "pegmatite on the north shore of Gorman Lake, intruding paragneiss, carries besides white albite and quartz, tourmaline, molybdenite, tantalite, pyrite and chalcopyrite." The locality is shown on Gelogical Survey of Canada Map 26-1960 (Quinn, 1960). These pegmatites, with tourmaline and "tantalite-columbite" minerals, are referred to by Ermanovics et al. (1975); the dykes occur in a narrow belt of greywacke and calc-silicate rocks in the Gorman Lake-Azure Lake area.

BIL Group, Gods Lake

The largest known pegmatite in northeastern Manitoba is located on the north shore of Gods Lake, 6 km west of the settlement of Gods River. A 2.3 km long valley, several m deep and about 10 m wide, has been eroded along the pegmatite, which is poorly exposed. The property is held by INCO, and it is reported that the discovery was made by prospector Carl Sherman in 1958. Subsequently, 2870 m of diamond drilling outlined a moderate-sized pegmatite containing a moderate grade of lithium mineralization and some beryl.

One rock sample from the property contains small irregular blades of spodumene, superficially similar to feldspar.

Bear Lake area

Milligan and Take (1954, p. 51) report the occurrence of columbite-tantalite and of allanite in their Eastern Bear Lake map area, 35 km north of Oxford Lake.

"In a pegmatite on the north side of Bear Lake a few crystals of columbite-tantalite were found ... as a thin fracture-filling or coating on the brownish feldspar of the pegmatite. The amount is probably small. The occurrence is on the NW shore of the small lake 4,000 feet [1200 m] north of Bear Lake at the western side of the map area."

Allanite was noted as a brown resinous mineral in pegmatitic phases, consisting of grey feldspar, quartz and coarse biotite, of a grey gneissic biotite granite. The occurrences are on the south side of the south channel of Bigstone River, near the east edge of the map area, and also about 1.6 km to the southeast, east of the map area.

Cuthbert Lake

Stringers of quartz and pegmatite occur along a sheared contact of altered gabbro with granite gneiss, on Cuthbert Lake 35 km southeast of Thompson. Dawson (1952, his 'Location C') reports that the pegmatite consists of coarsely crystalline quartz, orthoclase and ankerite, with small plates of tantalite.

B). Churchill Province

Wolf Rapid

Quinn (1956) reported a "hybrid gneiss of brownish impure quartzite in beds one to three inches thick, with intercalated sills of granite and granite pegmatite;" some of the sills contain disseminated small flakes of molybdenite. The occurrence is on the east bank of the Driftwood River, about 60 km north of Wekusko Lake.

Southern Indian Lake

Cranstone (1972) reported the occurrence of molybdenite in pegmatites:

"Scattered molybdenite-bearing pegmatites were found in the Wasekwan-type migmatites near Missi Falls (Map 71-2-19), and in the contact zone between Sickle-type gneisses and the porphyritic hornblende-quartz monzonite near Sandhill Bay (Map 71-2-13)."

Zangeza Bay, Reindeer Lake

Molybdenite crystals up to 1.5 cm were reported by McRitchie (1981) in small lenticular quartz veins in late pink granites within the Chipewyan Batholith on Perch Bay.

Veal Lake

Mineral Inventory card 64N/13 U 1, in Bamburak (1980), includes some details on an occurrence of uraninite and molybdenite in the Veal Lake area in the extreme northwest corner of Manitoba.

"Uraninite and molybdenite occur in Precambrian sills of white, coarse-grained to pegmatitic quartz monzonite within pelitic gneiss ... The quartz monzonite is 'crushed' in places. It is cut by pink pegmatite." The locality is about 370 km north-northwest of Lynn Lake. The property was drilled in 1969 by Yukon Antimony Corporation Ltd.

This occurrence and other occurrences of radioactive minerals in the Kasmere Lake area are summarized by Weber et al. (1975, p. 128-142).

REFERENCES

Alcock, F.J.
1920: The Reed-Wekusko map area, northern Manitoba; Geological Survey of Canada, Memoir 119.

Anderson, A.J. and Černý, P.
1983: Leucogranites and pegmatites in the Cross Lake area, Manitoba; Project A-12; **in**: Centre for Precambrian Studies, University of Manitoba, Annual Report for 1982, p. 100-108.

Armstrong, C.W.
1969: The role of replacement processes in the formation of complex lithium pegmatites; Unpublished Ph.D. thesis, University of Western Ontario, 134 p.

Ayres, L.D. and Černý, P.
1982: Metallogeny of granitoid rocks in the Canadian Shield of Canada; Canadian Mineralogist, v. 20, p. 439-536.

Bamburak, J.D.
1980: Mineral inventory of Manitoba; Manitoba Mineral Resources Division, Economic Geology Report ER79-6.

Bannatyne, B.B.
1972: Pegmatite Project; **in**: Summary of Geological Field Work, 1972; Manitoba Mines Branch, Geological Paper 3/72, p. 50-53.

Barry, G.S.
1959: Geology of the Oxford House-Knee Lake area, Manitoba Mines Branch, Publication 58-3.

Bateman, J.D.
1943: Tin in Manitoba; Canadian Mining Journal, v. 64, p. 273-278.
1943b: Scheelite near Falcon Lake, Manitoba; The Precambrian v. 16, no. 8, p. 4-7, 13.

Beakhouse, G.P.
1977: A subdivision of the western English River Subprovince; Canadian Journal of Earth Sciences, v. 14, p. 1481-1489.

Bell, C.K.
1962: Cross Lake map-area, Manitoba; Geological Survey of Canada, Paper 61-22.

Breaks, F.W., Bond, W.D., and Stone, D.
1978: Preliminary geological synthesis of the English River Subprovince, northwestern Ontario and its bearing upon mineral exploration; Ontario Geological Survey, Miscellaneous Paper 72, 55 p.

Brinsmead, Ralph
1960: Manitoba mine yields rare metals: Chemalloy Minerals Ltd., Bernic Lake, Manitoba; Precambrian, v. 33, no. 8, p. 17-39.

Brisbin, W.C. and Trueman, D.L.
1982: Dilational mechanics of fractures during pegmatite emplacement, Winnipeg River area, Manitoba; Geological Association of Canada-Mineralogical Association of Canada Annual Meeting, Winnipeg; Program with abstracts, v. 7, p. 40.

Bristol, N.A.
1962: An X-ray powder examination of some pegmatite minerals from southeastern Manitoba; Unpublished M.Sc. Thesis, University of Manitoba, Winnipeg.

Bruce, E.L.
1917: Molybdenite near Falcon Lake, Manitoba; Summary Report, Geological Survey of Canada, 1917, pt. D, p. 220-250.

Burt, R.O., Flemming, J. and Trueman, D.L.
1982: Ore processing at Tantalum Mining Corporation; **in**: Granitic pegmatites in science and industry, ed. P. Cerny; Mineralogical Association of Canada Short Course Handbook, v. 8, p. 495-504.

Černá, I.
1970: Mineralogy and paragenesis of amblygonite and montebrasite in the Tanco (Chemalloy) pegmatite, Bernic Lake, Manitoba; Unpublished thesis, University of Manitoba.

Černý, P.
1978: Alteration of pollucite in some pegmatites of southeastern Manitoba; Canadian Mineralogist, v. 16, p. 89-95.
1982: The Tanco pegmatite at Bernic Lake, southeastern Manitoba; **in**: Granitic pegmatites in science and industry; Mineralogical Association of Canada Short Course Handbook, v. 8, p. 527-543.
1983: Background study of strategic mineral and rare element distribution in granitic pegmatites, northwest Superior Province in northwest Manitoba; Department of Earth Sciences, University of Manitoba, unpublished paper, 29 p.

Černý, P. and Brisbin, W.C.
1982: The Osis Lake pegmatitic granite, Winnipeg River district, southeastern Manitoba; **in**: Granitic pegmatites in science and industry, ed. P. Cerny; Mineralogical Association of Canada Short Course Handbook, v. 8, p. 545-555.

Černý, P. and Bristol, N.A.
1972: New mineral occurrences in pegmatites of southeastern Manitoba; Canadian Mineralogist, v. 16, p. 89-95.

Černý, P. and Harris, D.C.
1973a: Allemontite and its alteration products from the Odd West pegmatite, southeastern Manitoba; Canadian Mineralogist, v. 11, p. 978-984.

1973b: Tapiolite, stibiotantalite, and antimonian microlite from the Odd West pegmatite, southeastern Manitoba; Canadian Mineralogist, v. 12, p. 76-78.

Černý, P. and Simpson, F.M.
1977: The Tanco pegmatite at Bernic Lake, Manitoba: IX. Beryl; Canadian Mineralogist, v. 15, p. 489-499.

Černý, P., Trueman, D.L., Ziehlke, D.V., Goad, B.E. and Paul, B.J.
1981: The Cat Lake-Winnipeg River and the Wekusko Lake pegmatite fields, Manitoba; Manitoba Mineral Resources Division, Economic Geology Report ER80-1, 216 p.

Černý, P. and Turnock, A.C.
1971a: Pegmatites of southeastern Manitoba; **in**: Geoscience studies in Manitoba, ed. A.C. Turnock; Geological Association of Canada Special Paper 9, p. 119-127.
1971b: Niobium-tantalum minerals from granitic pegmatites at Greer Lake, southeastern Manitoba; Canadian Mineralogist, v. 10, p. 755-772.
1975: Beryl from granitic pegmatites of Greer Lake, southeastern Manitoba; Canadian Mineralogist, v. 13, p. 55-61.

Cole, L.H. and Eardley-Wilmot, V.L.
1926: Lithium-bearing minerals in Canada; **in**: Investigations of mineral resources and the mining industry, 1975; Mines Branch, Canada, Report No. 669, p. 69-75.

Corkery, M.T. and Lenton, P.G.
1983: Southeast Cross Lake-west Pipestone Lake; Manitoba Mineral Resources Division, Preliminary Map 1983N-3.

Cranstone, D.A.
1968: Geology of the Watt Lake area (east half); Manitoba Mines Branch, Publication 61-5.

Cranstone, J.R.
1972: Geology of the Southern Indian Lake area, northeastern portion; Manitoba Mines Branch, Publication 71-2J.

Crombie, G.P.
1948: Geology of the Barrington Lake area; Manitoba Mines Branch, Preliminary Report and Map 47-6.

Crouse, R.A., and Černý, P.
1972: The Tanco pegmatite at Bernic Lake, Manitoba; I. Geology and Petrogenesis; Canadian Mineralogist, v. 11, p. 591-608.

Crouse, R.A., Černý, P., Trueman, D.L. and Burt, R.A.
1979: The Tanco pegmatite, southeastern Manitoba; Canadian Mining and Metallurgical Bulletin, v. 72, p. 142-151.

Davies, J.F.
1952: Geology of the Oiseau (Bird) River area; Manitoba Mines Branch, Publication 51-3.
1954: Geology of the West Hawk Lake-Falcon Lake area; Manitoba Mines Branch, Publication 53-4.
1955: Geology and mineral deposits of the Bird Lake area; Manitoba Mines Branch, Publication 54-1.
1956a: Geology of the Booster Lake area; Manitoba Mines Branch, Publication 55-1.
1956b: Manitoba lithium deposits (Cat Lake-Winnipeg River area); Canadian Mining Journal, v. 77, p. 78-79; Precambrian, v. 29, p. 46-50; Western Miner, v. 29, p. 35-37.
1957: Geology of the Winnipeg River area (Shatford Lake-Ryerson Lake); Manitoba Mines Branch, Publication 56-1.
1958: The lithium and beryllium pegmatites of southeastern Manitoba; Canadian Institute of Mining and metallurgy Bulletin, v. 61, p. 230-236.

Davies, J.F., Bannatyne, B.B., Barry, G.S. and McCabe, H.R.
1962: Geology and mineral resources of Manitoba; Manitoba Mines Branch, Publication, 190 p.

Dawson, A.S.
1942: Molybdenite occurrences in Boundary Area, Manitoba; Unpublished report, Manitoba Minerals Resources Division files.
1952: Geology of the Partridge Crop Lake area; Manitoba Mines Branch, Publication 41-1.

DeLury, J.S.
1917: Molybdenite at Falcon Lake, Manitoba; Canadian Mining Journal, v. 38, p. 460-462.
1926: Pegmatites of southeastern Manitoba; Canadian Mining Journal, v. 47, p. 695-697.
1927: The mineral resources of southeastern Manitoba; Industrial Development Board of Manitoba, 55 p.
1929: Tin prospects in Manitoba; Canadian Mining Journal, v. 50, p. 810-813.
1930: Beryl in Manitoba; Canadian Mining Journal, v. 51, p. 1015-1018.

DeLury, J.S. and Ellsworth, H.V.
1931: Uraninite from the Huron Claim, Winnipeg River area; American Mineralogist, v. 16, p. 569-575.

Derry, Duncan R.
1930: Tin-bearing pegmatites in eastern Manitoba; Economic Geology, v. 25, p. 145-159.

Downie, D.L.
1936: Stull Lake sheet (west half), Manitoba and Ontario; Geological Survey of Canada, Map 451A.

Eardley-Wilmot, V.L.
1925: Molybdenite; Mines Branch, Canada, Report No. 592, p. 54-57.

Ellsworth, H.V.
1932: Rare-element minerals of Canada; Geological Survey of Canada, Economic Geology Series No. 11.

Flemming, J., Mills, C., and Burt, R.O.
1982: Tanco's rare metal concentrator; Canadian Mining Journal, v. 103, no. 3, p. 40-47.

Frarey, M.J.
1951: Crowduck Bay, Manitoba; Geological Survey of Canada, Map 987A.

Gass, N.J.
1957: Pegmatites of the Winnipeg River area; Unpublished M.Sc. thesis, Dalhousie University.

Goad, B.E., and Černý, P.
1980: Peraluminous pegmatite granites and their pegmatitic aureoles in the Winnipeg River district, southeastern Manitoba; Canadian Mineralogist, v. 19, p. 177-194.

Grice, J.D.

1970: The nature and distribution of tantalum minerals in the Tanco (Chemalloy) mine pegmatite at Bernic Lake, Manitoba; Unpublished M.Sc. thesis University of Manitoba, 82 p.

Howe, A.C.A. and Rowntree, J.C.

1967: Geology and economic significance of the Bernic Lake pegmatite; The Canadian Mining and Metallurgical Bulletin, v. 60, p. 207-212.

Hutchinson, R.W.

1959: Geology of the Montgary pegmatite; Economic Geology, v. 54, p. 1525-1542.

Jambor, J.L. and Potter, R.R.

1967: Rubidium-bearing dykes, Gods River area, Manitoba; Geological Survey of Canada, Paper 67-15.

Janes, D.A.

1976: Southeastern Manitoba (Winnipeg River project); **in**: Manitoba Mineral Resources Division Report of Field Activities 1976, p. 60-63.

1978a: Geology of the west part of Kenora sheet (NTS 52E); Manitoba Mineral Resources Division, Preliminary Map 1978F-1, 1:250 000.

1978b: Geology of the west part of Pointe du Bois sheet (NTS 52L); Manitoba Mineral Resources Division, Preliminary Map 1978F-2, 1:250 000.

Janes, D.A. and Malyon, J.

1977: Southeastern Manitoba; **in**: Manitoba Mineral Resources Division, Report of Field Activities 1977, p. 88-91.

Lamb, C.F.

1975: Southeastern Manitoba; **in**: Summary of Geological Fieldwork 1975; Manitoba Mineral Resources Division Geological Paper 2/75, p. 38-39 (and associated Preliminary Geological Maps).

Lang, A.H.

1952: Canadian deposits of uranium and thorium (Interim Account); Geological Survey of Canada, Economic Geology Series No. 16, p. 116-117.

Lenton, P.G.

1979: Mineralogy and petrology of the Buck claim lithium pegmatite, Bernic Lake, southeastern Manitoba; Unpublished M.Sc. thesis, University of Manitoba, 164 p.

Lenton, P.G. and Anderson, A.J.

1983: Granite-pegmatite investigation, Cross Lake; in: Report of Field Activities 1983, Manitoba Mineral Resources Division, p. 46-50.

McCannell, J.D.

1976: Geological scintillometer survey report, Groundstar Resources Limited; McVittie-Perkins option, Rennie-West Hawk Lake area, Manitoba; Manitoba Mineral Resources Division, Geoscience Data Section, File 92216.

McCartney, G.C.

1930: Detailed report of the pegmatites of southeastern Manitoba; Unpublished report, Manitoba Mineral Resources Division files.

1930b: Summary report of the pegmatites of southeastern Manitoba; unpublished report, Manitoba Mineral Resources Division files.

McRitchie, W.D.

1971a: The petrology and environment of the acidic plutonic rocks of the Wanipigow-Winnipeg Rivers region, southeastern Manitoba; **In**: Geology and geophysics of the Rice Lake region, southeastern Manitoba (Project Pioneer), ed. W.D. McRitchie and W. Weber; Manitoba Mines Branch Publication 71-1, p. 7-61.

1971b: Geology of the Wanipigow-Winnipeg Rivers region, SE. Manitoba; **in**: Geology and geophysics of the Rice Lake region, southeastern Manitoba (Project Pioneer); Manitoba Mines Branch Publication 71-1, Map 71-1/1.

1981: Zangeza Bay; **in** Manitoba Mineral Resources Division, Report of Field Activities, 1981; GS-2.

Michalkow, A.

1954: Structural geology and petrology of the Lily Pond Area, Manitoba; Unpublished M.Sc. thesis, University of Manitoba.

Milligan, G.C., and Take, W.F.

1954: Geology of the Eastern Bear Lake area; Manitoba Mines Branch, Publication 53-1.

Mulligan, R.

1957a: Lithium deposits of Manitoba, Ontario and Quebec; Geological Survey of Canada, Paper 57-3.

1957b: Lithium in Canada — recent developments and geological features; Canadian Mining Journal, v. 78, p. 121-125.

1960: Beryllium occurrences in Canada (Preliminary account); Geological Survey of Canada, Paper 60-21.

1965: Geology of Canadian lithium deposits; Geological Survey of Canada, Economic Geology Report No. 21, 131 p.

1968: Geology of Canadian beryllium deposits; Geological Survey of Canada, Economic Geology Report No. 23, 109 p.

1975: Geology of Canadian tin occurrences; Geological Survey of Canada, Economic Geology Report No. 28, 155 p.

Nickel, E.H.

1960: The chemical composition and physical properties of pollucite from Bernic Lake, Manitoba; Canada Department of Mines and Technical Surveys, Mineral Science Division, Test Report M-60-14, 6 p.

1961: The mineralogy of the Bernic Lake pegmatite, southeastern Manitoba; Mines Branch, Canada; Technical Bulletin TB20, 38 p.

Nickel, E.H., Rowland, J.F. and McAdam, R.C.

1963: Wodginite — a new tin-manganese tantalite from Wodgina, Australia, and Bernic Lake, Manitoba; Canadian Mineralogist, v. 7, p. 390-402.

Nier, A.O., Thompson, R.W. and Murphy, B.F.

1941: The isotopic composition of radiogenic lead and the measurement of geologic time, III; Physics Review, v. 60, p. 112-116.

Norton, James, J.
1983: Sequence of mineral assemblages in differentiated granitic pegmatites; Economic Geology, v. 78, p. 854-874.

Olson, K.J. and Černý, P.
1983: The lower Tanco pegmatite at Bernic Lake, southeastern Manitoba; Project B-13; **In**: Centre for Precambrian Studies, University of Manitoba; Annual Report for 1982, p. 108-110.

Papish, Jacob
1929: New occurrences of germanium. II. The occurrence of germanium in silicate minerals; Economic Geology, v. 24, p. 470-480.

Parsons, A.L.
1934: The utilization of the semiprecious and ornamental stones of Canada; University of Toronto Studies, Geological Series No. 36, p. 13-21.

Paul, B.J.
in prep.: Mineralogy, geochemistry, and petrology of the Huron claim pegmatite, southeastern Manitoba; Unpublished M.Sc. thesis, University of Manitoba.

Phillips, K.A.
1978: Minerals of Manitoba, Volume 1: Non-metallic and pegmatitic; Manitoba Mineral Resources Division, Educational Series 78/1.

Potter, R.R.
1962: Gods River map-area, Manitoba; Geological Survey of Canada, Paper 62-8.

Quinn, H.A.
1956: Mineral occurrences between Chipewyan and Herb Lakes, Manitoba; Precambrian vol. 29, No. 10, p. 6-14; vol. 24, No. 11, p. 6-12; vol. 30, No. 1, p. 28-33.
1960: Geology of Island Lake; Geological Survey of Canada, Map 26-1960 with marginal notes.

Raicevic, D.
1968: Concentration of tantalum from the Bernic Lake pegmatite deposit; Canadian Institute of Mining and Metallurgy Bulletin, v. 61, p. 1439-1444.

Rinaldi, R.
1970: Crystallography and chemistry of Li- Rb- Cs-bearing micas from the Tanco (Chemalloy) pegmatite, Bernic Lake, Manitoba; Unpublished M.Sc. thesis, University of Manitoba.

Rousell, D.H.
1965: Geology of the Cross Lake area; Manitoba Mines Branch, Publication 62-4, 69 p.

Rowe, R.B.
1954: Pegmatitic lithium deposits in Canada; Economic Geology, v. 49, p. 501-515.
1956: Lithium deposits of Manitoba; Geological Survey of Canada, Paper 55-26.
1960: Niobium (columbium) deposits of Canada; Geological Survey of Canada, Economic Geology Report No. 18.

Rowe, R.C.
1929: The Manitoba tin discoveries; Canadian Mining Journal, v. 50, p. 284-285.

Russell, G.A.
1957: Structural studies, Snow Lake-Herb Lake area; Manitoba Mines Branch, Publication 55-3.

Shepherd, F.D.
1938: The lithium situation in Manitoba; Precambrian, v. 11, p. 3-6.

Sopuck, V.
1972: Report of geological investigations on Reservation 105, Wilsie-Red Cross area, Manitoba, for the R.D.P. Canadian Joint Venture; Mineral Resources Division, Manitoba, Exploration Services Section file 91808.

Spence, Hugh, S.
1928: Lithium minerals in southeastern Manitoba; Canadian Mining Journal, v. 49, p. 829-831.
1932: Feldspar; Mines Branch, Canada, Report No. 731.

Springer, G.D.
1948: Geology of the Cat Lake-Maskwa Lake area; Manitoba Mines Branch, Preliminary Report 47-2.
1949a: Geology of the Cat Lake-Winnipeg River area; Manitoba Mines Branch, Preliminary Report and Map 48-7.
1949b: Geology and mineral deposits of a part of southeastern Manitoba; The Precambrian, v. 23, p. 8-10, 35.
1950: Mineral deposits of the Cat Lake-Winnipeg River area; Manitoba Mines Branch, Publication 49-7.
1952: Geology of the Rennie-West Hawk Lake area; Manitoba Mines Branch, Publication 50-6.

Stockwell, C.H.
1933a: Genesis of a lithium pegmatite on the Bear mineral claim, southeast Manitoba; Transactions of the Royal Society of Canada, Third Series — vol. XXVII — Section IV, p. 27-36.
1933b: The genesis of pegmatites of southeast Manitoba; Transactions of the Royal Society of Canada, Third Series — Vol. XXVII — Section IV, p. 37-51.

Trueman, D.L.
1978: Exploration methods in the Tanco mine area of southeastern Manitoba, Canada; Energy, v. 3, p. 293-298.
1980: Stratigraphic, structural and metamorphic petrology of the Archean greenstone belt at Bird River, Manitoba; Unpublished Ph.D. thesis, University of Manitoba, 155 p.

Trueman, D.L. and Burt, R.O.
1983: The Tanco pegmatite: an industrial mineral resource; Canadian Institute of Mining and Metallurgy, Preprint Paper No. 60, Winnipeg.

Trueman, D.L. and Černý, P.
1982: Exploration for rare-element granitic pegmatites; **In**: Granitic pegmatites in science and industry, ed. P. Cerny; Mineralogical Association of Canada Short Course Handbook, v. 8, p. 463-493.

Tyrrell, J.B. and Dowling, D.B.
1900: Report on the east shore of Lake Winnipeg; Geological Survey of Canada, Annual Report, v. 11, pt. G.

Vokes, F.M.
1963: Molybdenite deposits of Canada; Geological Survey of Canada, Economic Geology Report No. 20.

Walker, T.L.
1931: Rare minerals in pegmatite, Pointe du Bois, Manitoba; University of Toronto Studies, Contributions to Canadian Mineralogy; Geological Series, No. 30, p. 9-13.

Weber, W., Schledewitz, D.C.P., Lamb, C.F. and K.A. Thomas
1975: Geology of the Kasmere Lake-Whiskey Jack Lake (North half) area (Kasmere Project); Manitoba Mineral Resources Division, Publication 74-2.

Williams, C.T. et al.
1978: Tantalum Mining Corporation of Canada Limited — Bernic Lake concentrator; **in**: Milling practice in Canada; Canadian Institute of Mining and Metallurgy, Special Volume 16.

Wilson, H.D.B.
1971: The Superior Province in the Precambrian of Manitoba; **in**: Geoscience studies in Manitoba, ed. A.C. Turnock; Geological Association of Canada, Special Paper 9, p. 41-49.

Wright, C.M.
1961: Geology and origin of the pollucite-bearing Montgary pegmatite, Manitoba; Unpublished Ph.D. thesis, University of Wisconsin.
1963: Geology and origin of the pollucite-bearing Montgary pegmatite, Manitoba; Geological Society of America Bulletin, v. 74, p. 919-946.

Wright, J.F.
1924: Geology and mineral deposits of Oiseau River Map-area, Manitoba; Geological Survey of Canada Summary Report, 1924, Part B, p. 51-104.
1930: Tin, lithium and beryllium deposits of southeast Manitoba, Canadian Mining Journal, v. 51, p. 514-517.
1932: Geology and mineral deposits of a part of southeast Manitoba; Geological Survey of Canada, Memoir 169.

APPENDIX: OTHER MOLYBDENITE-BEARING PEGMATITES, BARREN LAKE TO STAR LAKE

Available data on molybdenite occurrences, other than on the Molly and Bendum claims, are summarized below. All the showings occur in a narrow belt extending from north of Falcon Lake to west of Star Lake (Fig. 3). The occurrences either were not examined or could not be located; some pits near recreational trails have reportedly been filled in. Both DeLury (1917) and Bruce (1917) reported the rare occurrence of beryl, but did not name specific deposits.

It is believed that detailed prospecting and possibly some stripping would be required to re-expose some of these reported occurrences. Some relatively small scheelite deposits, usually in quartz veins, have been described by Bateman (1943), Springer (1952), Davies (1954), and Little (1959). They occur along shears and in fracture zones in metavolcanics, mainly parallel to the intrusive contact with the Frances Lake metasomatic granodiorite.

Reports on the molybdenite occurrences are in ESS files 91082 and 91084. (A figure showing approximate locations of claims is included).

T.A.R. No. 1 claim (SE 1/4, sec. 33, tp. 8, rge. 16 EPM, unsurveyed)

The claim is located southwest of the Molly claim (#1 post T.A.R. = SW corner post Molly).

Dawson (1942) reported: "An old pit exposes a 6-foot (1.8 m) northeast striking pegmatite on the boundary of this claim with T.A.R. 3 claim (adjoining to the west). In the pit, the pegmatite contains scattered books of coarse (18 x 6 mm) molybdenite. The grade of the material appears to be low."

Smuggler claim (surveyed claim — south part of NW 1/4, sec. 34, tp. 8, rge. 16 EPM)

DeLury (1917) reported: "On a hill on the Smuggler claim a dyke about 8 feet (2.4 m) in width . . . shows scales of molybdenite on the outcrop. Just below the hill where it passes into the muskeg, part of the dyke is exposed. Here it is quite coarse grained and a shot brought out several large crystals of the mineral. Between a half pound and a pound of molybdenite were shown on about a square yard of exposed pegmatite." Another dyke on the claim, exposed for 60 m, and 0.6 to 1.2 m in width, showed traces of molybdenite in outcrop. The dykes strike both concordantly and perpendicular to the original trend (ESS file 91082).

DeLury (1917) reported also "At a point on the Smuggler claim a narrow pegmatite dyke cuts across the formation and intersects a previously formed vein of reddish quartz which is parallel to the schistosity. This reddish quartz carried lamellae of molybdenite in cross fractures." This is the only occurrence noted in the area by DeLury where the molybdenite is secondary.

Union Jack claim (surveyed claim, NW ¼ and NE 1/4, sec. 34, tp. 8, rge. 16 EPM)

DeLury (1917) reported: "On the Union Jack claim, an opening was made in a dyke four to five feet (1.2 to 1.5 m) in width. Molybdenite was found here in large crystals and groups of lamellar masses." The dyke strikes northeasterly and extends onto the Lucky Jack claim to the east.

Lucky Jack claim (surveyed claim, NE 1/4, sec. 34, tp. 8, rge. 16 EPM)

DeLury (1917) reported: "On the Lucky Jack claim, a vein which had been followed from the Union Jack claim, with a width varying from 2 to 8 feet (0.6 o 2.4 m) was found to be opened at a point where the vein had a width of three to four feet (0.9 to 1.2 m). The best showing of molybdenite crystals was seen here." The dyke is parallel to the regional trend.

A possible newly reported pegmatite occurrence was noted in field examination of the Union Jack and Lucky Jack claims. It is exposed at the base of a south-facing cliff, for a distance of a few metres, but its full length is not known. A crystal of ixiolite occurs at the convergent point of a radiating mass of pink cleavelandite, and a 3 mm platy mineral in pink albite was identified as tantalite-columbite. The dyke is near the south edge of the claims, and was noted only when the moss covering was removed.

Winnipeg claim (surveyed claim, centred near SE corner of l.s. 3, tp. 9, rge. 16 EPM)

DeLury (1917) reported: "About 300 feet (91.4 m) from the granite contact on the Winnipeg claim a dyke three to four feet (0.9 to 1.4 m) in width occurs. Some medium sized crystals and flakes of molybdenite were seen in an opening here."

Lake No. 8 claim (unsurveyed, shown in SE 1/4, sec. 3, tp. 9, rge. 16 EPM)

Dawson (1942) reported: "a number of trenches had been opened on a red pegmatite-aplite dyke on this claim. The northeasterly-striking dyke can be seen at intervals along a length of 280 feet (85.4 m) and has a width of zero to 5 feet (0. to 1.5 m). The only molybdenite seen occurs at a point near the northeast end where the dyke pinches out." The dyke is about 220 m northeast of the No. 3 post of the claim. Near its western end, the strike is more westerly, with a dip of 65° south.

Felrite 2 and 4 claims (shown as unsurveyed claims in west central part of sec. 2, tp. 9, rge. 16 EPM)

An occurrence of sheelite is present on these claims. Dawson (1942) reported: "Approximately 1200 feet (366 m) to the southwest of the principal sheelite occurrence on these [Felrite] claims, a cross-fracture (strikes) N80° .. The fracture dips 65°S and is filled by 8 to 18 inches (20 to 46 cm) of aplitic material on the hangingwall of which is a pegmatitic quartz vein 4 to 6 inches (10 to 15 cm) in width. The quartz contains appreciable quantities of molybdenite in its hangingwall section. Molbydite produced by oxidation of molybdenite . . . gives a golden fluorescence under the ultra-violet lamp."

Hall claim (surveyed claim, approximately l.s. 5, sec. 12, tp. 8, rge. 16 EPM)

Dawson (1942) reported: "Two occurrences of molybdenite were examined on this claim owned by Falcon Lake Gold Mines Ltd. One of these, located close to the north boundary of the claim, consists of a small body of pegmatite apparently striking nearly east and dipping 35 degrees south. Only one small outcrop of the material is exposed, and the body appears to have a true width of approximately 3 feet (0.9 m). The material appears to be vein quartz injected by small dykes and some pieces carrying abundant molybdenite are seen on the dump. Picked samples are reported to have carried gold. The percentage of molybdenite in the body appears to be very low.

"Several hundred feet to the south ... a narrow, flat-lying dyke has been opened by two large pits. In one of these pits the dyke, dipping 30 degrees south, has been completely removed and its footwall forms the sloping floor of the pit. It appears that this dyke ended abruptly at the south face of the pit which may represent a steeply-dipping fault plane. Twenty feet (6 m) to the south of the west end of this pit, and at an elevation approximately 15 feet (4.6 m) above the footwall exposed in the pit, an 8-inch (20 cm) pegmatite dyke with a dip of 10 to 20 degrees south is poorly exposed in the east face of a large pit. This dyke contains quartz, white and pink feldspar and a little sporadically distributed coarse molybdenite. Some pieces on the dump near the pits contain abundant molybdenite; the material is reported to also carry gold." (ESS file 91084).

DeLury (1917) reported small grains of bismuth occur in the first deposit.

IXL claim, west of Star Lake (in SW 1/4, sec. 24, tp. 6, rge. 18 EPM)

A pegmatitic quartz vein on a small outcrop in a muskeg area, to the west of Star Lake, is described by DeLury (1927). The vein is up to 1.8 m and is in schist, 15 to 30 m from the granite contact. Molybdenite and bismuthinite occur in the quartz, over a width of several centimetres. A narrow band of pegmatite occurs along both walls of the vein. The claim was staked in 1917 by N. Martin.